The
Electrical Review

VOL. CIV. MAY 31, 1929. No. 2,688.

THE OLDEST ELECTRICAL PAPER. ESTABLISHED 1872.

Published every FRIDAY, Price 6d.

Chairman: H. ALABASTER.

Commercial Editor: A. H. BRIDGE. *Joint Managing Directors:* G. H. ALABASTER, Assoc.I.E.E. E. A. GATEHOUSE M.I.E.E., A.M.INST.C.E. *Manager and Secretary:* E. S. MIDDLETON

OFFICE: 4, LUDGATE HILL, LONDON, E.C.4.

Telegraphic Address: "AGEKAY, CENT, LONDON," Code, A B C. Telephone No.: Central 5871 (5 lines.)

The "Electrical Review" is the recognised medium of the Electrical Trades, and has by far the Largest Circulation of any Electrical Industrial Paper in Great Britain.

SUBSCRIPTION RATES, Postage Free: United Kingdom, £1 14s. 8d.; Canada, £1 12s. 6d. Colonial and Foreign, £2 1s. 6d. per annum. Cheques and Postal Orders (on Chief Office, London) to be made payable to THE ELECTRICAL REVIEW, LIMITED, and crossed "Midland Bank, Newgate Street Branch."

For List of Foreign Agents for the ELECTRICAL REVIEW see Advertisement Supplement.

Contents:

	PAGE
The I.M.E.A. Convention	947
Government Trade Inquiry in South America	858
The Refrigerator Market	948
Rural Electrification	948
The I.M.E.A. Convention.—I *(illus.)*	949
Electricity Supply at Torquay *(illus.)*	951
Immersion Water Heaters, by R. H. Rawll *(illus.)*	956
Textile Plant Electrification, by C. Carter	958
Business and Industrial Notes	962
Lighting and Power Notes	966
Tramway and Railway Notes	967
Telegraph and Telephone Notes	967
Radio Notes	968
Contract Information	968
Forthcoming Events	970
Notes	970
Institution Notes	972
Our Personal Column	972
Financial Section—	
New Companies Registered	973
Official Returns of Electrical Companies	974
City Notes	974
Financial Section—*contd.*	
Stocks and Shares	977
The Chinese Position and Outlook	979
Domestic Appliances in Australia	979
A Control Gear Manufactory *(illus.)*	980
Obtaining Consumers in Rural Areas, by Lt.-Col. W. A. Vignoles	983
Rural Electrification	986
Electro-plating Equipment	986
Domestic Electrical Developments *(illus.)*	987
Selected Radio-telephone Apparatus	988
New Electrical Devices, Fittings, and Plant *(illus.)*	989
A New Radio Direction Finder *(illus.)*	990
Power Plant in America	991
Legal	991
Correspondence—	
The Compulsory Earthing of Prepayment Meters	991
132,000-volt Cables	992
An Old Problem—from a New Point of View	992
Published Specifications	993
Trade Mark Applications	993
New Work for Contractors	994

The I.M.E.A. Convention.

THE annual convention of the Incorporated Municipal Electrical Association is once more upon us. It is the thirty-fourth of the series of assemblies that are looked forward to yearly in pleasurable anticipation by all who are privileged to share in its profits and recreation. Having enjoyed the excursion into the West Country last year on the occasion of the Bath Spa meeting, delegates are to travel further westward this year to the fair Devonshire health resort of Torquay, the amenities of which neighbourhood are briefly referred to on later pages of this issue. The social part of these annual meetings is becoming almost as important as the strictly professional part, and it certainly deserves the prominence given to it in the programme of events, which is outlined on subsequent pages. Not the least of the pleasures of the Conventions is the yearly meeting of acquaintances, often casually met, whose mutual interest in municipal electrical matters quite as often ripens into firm friendship.

As is customary the morning sessions are being devoted to the reading, in abstract, and discussion of papers: the I.M.E.A. Council seeks to ascertain beforehand from members, by means of circular letters asking for suggestions, what subjects they desire to be discussed, and only to gentlemen possessing adequate knowledge of the chosen subjects is the invitation extended to submit papers. Thus are the standard of papers and general tone of the proceedings prevented from depreciating.

The exhibition of electrical appliances, largely of a domestic character, which is arranged each season for the instruction of delegates, has become a popular feature, though limited because all manufacturers are not eligible to stage displays of their products. This year some 37 exhibitors, including the B.E.D.A., E.L.M.A., and E.A.W., are taking part in the show and it is to be hoped that the local public will avail itself of the opportunity of visiting it. A sign of the times is the arrangement of an official "Women's Day" during which members of the Electrical Association for Women will be privileged to take a part in the Convention.

The I.M.E.A. is a very important body, representative of nearly 250 local authorities that undertake the supply of electricity; it is a source of valuable information to local authorities; it protects and advises the

municipal section of the electricity supply industry through the many intricacies it has to negotiate from time to time. Generally delegations are adequate in the aggregate; this year promises a record gathering, with indications that the ladies and gentlemen attending may exceed four figures in number, though some subscribing authorities do not send their full complement, and a few do not seem to appreciate the unwisdom of remaining unrepresented entirely. They do not appear to consider that there is any obligation on their part to demonstrate their appreciation of the voluntary work done on their behalf by the Council and members of the Association, by supporting the latter's annual assembly.

In the present "Committee Age" municipal councillors are not infrequently elected to committees, not because of any particular desire to serve thereon, but simply because somebody must be nominated. In some cases capable municipal engineers are greatly hampered by the efforts of committees the members of which lack adequate knowledge of the matters on which decisions have to be reached. In other cases the committees leave everything to their engineers so long as all is plain sailing, and then throw them overboard when anything goes wrong.

Careful attention to the subjects discussed, both formally and informally, at such conventions as those held by the I.M.E.A. should do much to assist both the engineers and their committees to work in harmony.

Government Trade Inquiry in South America.

In a leading article on "Export Trading" published in our issue of April 12th, we urged the reorganisation of the Department of Overseas Trade to give it the means to despatch electrical and engineering experts upon visits to various overseas markets for the preparation of specialised reports which the industry at home could use in connection with its expansion efforts. We said: "We certainly believe that if the Department were to send a few real live and energetic engineering men about the world, either supplementing, or co-operating with, the work of Trade Commissioners, more genuine and business-getting help would be rendered than by the peripatetic wanderings of officials at home telling us things we have been told a thousand times before."

We need hardy say that following upon the expression of these opinions, we learn with satisfaction that the Board of Trade has appointed an economic mission to visit two markets which are of the utmost importance to the British electrical and engineering industries, namely, Argentina and Brazil. Viscount D'Abernon, will be president; Sir W. C. Lees will represent the textile industries; Mr. G. E. Rowland will represent the engineering industries generally, and while his specialised branch of engineering work is agricultural, he will find an interesting situation to investigate and report upon in connection with electrical developments; Mr. Julian Piggott will act for the iron and steel industries. The mission will be accompanied to Argentina by the popular Commercial Counsellor to H.M. Embassy, Buenos Aires, Mr. H. O. Chalkley, and Mr. H. W. Wiswould, of the D.O.T., will act as secretary to the mission.

Just as these lines appear the General Election of 1929 will have ended, but whatever the result may be between the Parties, we still hold, as we did in our article of April 12th, that greater importance attaches to the improvement of British trade, by sound and legitimate means, than to any of the "forced growth" proposals that have been advanced as the means for providing work for our great army of unemployed.

May we hope that this Economic Mission to Brazil and Argentina will be successful in the preliminary survey that it is to make before leaving these shores, and that as a result of an investigation made with a foreknowledge of the difficulties, it will be able to render the electrical and other engineering industries of this country much needed assistance, and thus ensure a continuous flow of orders to our factories instead of those of others. We congratulate the Board of Trade upon planning a foreign trade visit so closely similar to that suggested in the Electrical Review.

The Refrigerator Market.

One indication of the scope for the electric refrigerator is provided by the monthly export statistics of the United States. The item "Refrigeration sets up to 1-ton capacity" has been growing during the last two or three years until it is now the largest single specified item in the list. In March the value of exported refrigerators represented about 10 per cent. of the total exports. The item is now subdivided to show sets up to ¼-ton capacity and sets of over ¼-ton up to 1-ton capacity. In March over 80 per cent. of the exports was of the former class, which indicates that the bulk of the apparatus concerned was of the domestic or small-shop description. The United Kingdom took 18 per cent. of the March exports, and was, in fact, the principal importer of American refrigerators. At this time of year such figures are worthy of attention and should lend added force to the E.D.A. June campaign.

Rural Electrification.

It has been known for some time that the Electricity Commissioners, the Development Commissioners, the Ministry of Transport, and the Ministry of Agriculture, have been collaborating in the formulation of a plan designed with the object of stimulating the use of electricity for all purposes in country districts. Estimates which have been carefully prepared have convinced the Commissioners of the practicability of supplying electricity economically for all farming, village, and domestic purposes in rural areas, and the scheme has been specifically framed to demonstrate that fact on a practical scale.

The area chosen for the experiment is in Bedfordshire, and the scheme is expected to be self-supporting in five years. A statement by the Minister of Transport relative to the financial arrangements will be found elsewhere in this issue, defining the assistance that the Minister has advised the Treasury to afford in the form of annual loans to help cover the losses that are expected to accrue during the initial years of operation. This help, and the sufficiently definite results that have been obtained from similar schemes which have not had the advantage of Government backing, leave little room for doubting the success of the demonstration, which should give a considerable impetus to the cause of rural electrification in general.

It is interesting to note that the Commissioners have framed their plan on the following basis: very careful attention to distribution cost; facilitating installation and the acquisition of apparatus and appliances on the hire-purchase system; and the intention to make supplies of energy available first and then invite all and sundry to avail themselves of the service. The last-mentioned feature is not only of considerable interest in comparison with the hitherto prevailing attitude towards attempts to justify expenditure on laying mains in anticipation of load in areas wherein there is no immediate demand for electricity, but also because it will enable prospective consumers to obtain supplies of electricity when they want them, relieving them of the obligation of demanding a supply and then waiting until sufficient similar applications have been lodged to make the service worth while to the supply authority

Appropriately, on another page appears a report of a meeting at which Lieut.-Col. W. A. Vignoles told members of the Overhead Lines Association how consumers can be obtained in rural areas, and attempted to enthuse his hearers with some of his own confidence in the future of country area electrification. It must not be assumed, of course, that every case must, of necessity, be profitable; exceptions exist to prove every rule, but the Electricity Commissioners' honest endeavour will emphasise the possibilities of the extended use of electricity in farming localities.

The I.M.E.A. Convention—I.

In view of the annual convention of the Incorporated Municipal Electrical Association, which is to be held at Torquay next week, the amenities of the district are referred to below, the programme outlined, and the local electricity generating undertaking described.

SHELTERED combes, deep-cut lanes, broad moorlands, fine sands, and delightful examples of old-world domestic architecture are but a few of the attractions of the typically Devonian county in which the Convention will meet this year.

Most characteristic of South Devon is its wonderful colouring: sky and sea contrast with the warm redness of the sandstone cliffs and soil. Prominent are its equable climate and red soil, and the luxuriance of vegetation; the irregularity of the coast, broken delightfully by unexpected creeks, estuaries, and bays, is one of its greatest charms.

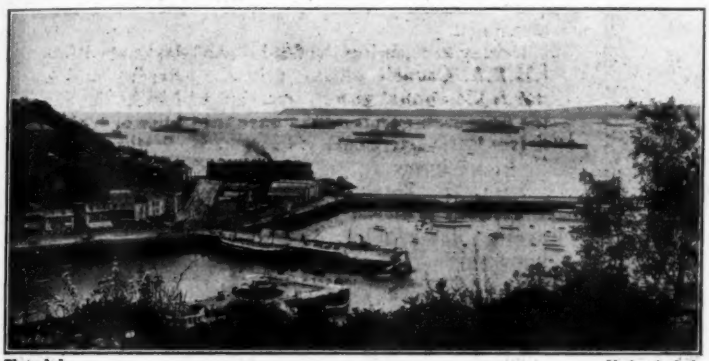


Photo by] [Judges', Ltd.

The Harbour and Warships in the Bay.

Torquay, with its trees and terraces, helped to make the sporting county one of England's playgrounds. Devonshire has played a large part in moulding the destinies of the nation, for the early navigators, soldiers, and colonists were men of Devon, which has, and still continues to, provide literary inspiration. Probably no other English county has richer flora, for what other can claim more streams and rivers and a more even year-round temperature? Semi-tropical plants flourish, as do flowers in abundant variety, and that giant of ferns, *Osmunda regalis*, may occasionally be seen growing in some moist valley to a height of 5 ft.

Of late years much has been done to tempt summer visitors, and winter residents also; but, built on a cluster of hills which jut into the sea, the pleasant Torquay promontory at the head of Torbay, a place of shelter long famed among sailors, has attracted town dwellers from its earliest days. The Roman Legions left good evidence of their occupation of the peninsula at Austey's Cove, Babbacombe, and on Warberry Hill. Norman association, too, is traced back to William the Conqueror's gift of the land of Tor to William de Brewere. However, the earliest records of the town are ecclesiastical, Tor Abbey, founded in 1196, having flourished there; but so late as the nineteenth century it was no more than the quay of the adjoining village of Torre. Fleets of warships found safe shelter in Torbay while awaiting orders during the Napoleonic wars; the vessels being often detained there for months, the officers' wives and families naturally visited the place and the virtues of the climate were soon appreciated. Thus Napoleon may be considered to have been the unconscious founder of this health resort, and when he approached the future town in 1815, standing on the deck of the *Bellerophon*, his prison ship, he exclaimed, "*Enfin, voilà un beau pays!*" That tribute of the tyrant of Europe has never been forgotten.

Few towns in England possess a sea-front to compare with that of Torquay. Given fine weather, this year's Convention should be as successful professionally, and socially too, as it has been in past seasons. The president, Mr. A. Nichols Moore, borough electrical engineer and tramway manager, Newport (Mon.), and Mr. A. C. Cramb, Croydon Corporation electrical engineer, the hon. secretary, have spared no efforts to maintain the tradition of the Convention. Mr. Cramb, who is responsible for the detailed organisation, has this year had to carry it out in difficult circumstances, but has proved himself equal to the occasion. Mr. H. F. G. Woods, borough electrical engineer and general manager, Torquay, has devoted much time to local arrangements, and Mr. Jno. W. Simpson, the new I.M.E.A. secretary, who has succeeded Miss Lanfear since the last Convention, is doing all he can to assist delegates.

On Monday, June 3rd, there will be a reception in the evening by the president, who will be supported by the Mayor of Newport (Councillor W. T. Griffiths), to be followed with music and dancing.

On Tuesday morning members will assemble in the Pavilion, a handsome structure built in 1911-12 at a cost of £25,000. A balcony runs round three sides and a tea room overlooks the sea. An open promenade facing the harbour and gardens runs along the roof and all four corners are surmounted by octagonal open-framed shelters. A civic welcome will be extended to the delegates by the Mayor of Torquay (Mr. H. Geen), after which the presidential address will be delivered; at its conclusion the ladies attending the meeting will take coffee with Mrs. Nichols Moore at the Medical Baths, a group of buildings in the Italian style. They were erected in 1852 on the site of a modest establishment

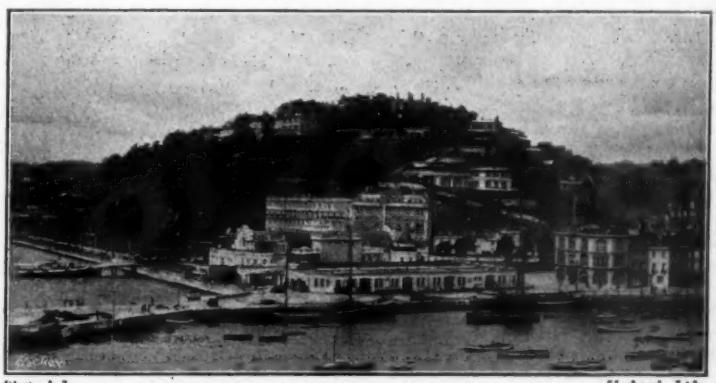


Photo by] [Judges', Ltd.

Waldon Hill, Torquay.

dating from 1817. In recent years the Corporation spent £25,000 on reconstruction, the medicinal baths being of varied character and including light, heat, and electric baths.

The paper to be read in abstract on the first day by Alderman W. Walker (Manchester) and discussed will deal with Whitleyism in the electricity supply industry from a management point of view.

Elliott & Fry [*London.*

Mr. A. Nichols Moore,
I.M.E.A. President, 1928-29.

In the afternoon an official visit will be paid to the electrical exhibition which is an annual feature of the Convention. Some 37 exhibitors will display cooking, water-heating, refrigeration, and other apparatus in the Old Torbay Hospital. The exhibition will be closed to the public on Tuesday afternoon and open to women only on Thursday morning.

In the evening there will be a reception by the Mayor and Mayoress (Mr. and Mrs. H. Geen) at the Town Hall, followed by music and dancing.

Wednesday morning's paper, by Mr. J. H. Rothwell (Town Clerk of Brighton, and hon. solicitor of the I.M.E.A.) and discussion will be on the subject of recent High Court cases and current legal problems in connection with the generation and supply of electricity. The afternoon discussion will be initiated by a paper by Mr. G. Porter (borough electrical engineer, Worthing) on the heavy-oil engine and its application to electricity supply undertakings.

At the invitation of the Torquay Municipal Electricity Committee (chairman: Councillor J. Taylor) members will attend a garden party at Tor Abbey in the afternoon and an official photograph will be taken. The Abbey is one of Torquay's links with the past: it was founded in 1196, richly endowed, and became the wealthiest of the Norbertine Order in the kingdom. The existing mansion, owned by the Cary family, embodies some features of the monastic house. The remains of the church and other buildings have been excavated and are worthy of inspection by all who are attracted by historic relics.

In the evening there will be a dance at the Medical Baths by invitation of the Mayor and Mayoress of Torquay.

The paper to be discussed on Thursday morning is to be read by Mr. E. J. Jennings (secretary of the Birmingham Corporation Electricity Department), his subject being the standardisation of methods of charging for electricity. In the afternoon the Local Authority Committee members' annual meeting will take place at the Medical Baths and at the same time the engineers' meeting (members of the A.M.E.E. only) will be held at the Torbay Hotel.

The annual dinner will be served in the Pavilion that evening, after which delegates will be able to dance in the Medical Baths ballroom by invitation of the Torquay Corporation.

Thursday is to be regarded as "women's day." Miss M. Partridge will lecture in the morning with the aid of charts on women's work in connection with rural electrification in Devonshire, and as before stated only women will be admitted to the exhibition that morning.

During the afternoon the Longpark Pottery Co.'s works, which are driven electrically, will be visited, and there will be a motor coach drive to Widecombe-in-the-Moor (where tea will be served) by way of Bovey Tracey and Hay Tor Rocks, returning by Ashburton. The Torquay Electricity Committee will provide the tea and transport.

Friday next, being the final day of the Convention, the I.M.E.A. Council will meet in the morning and afterwards the annual general meeting will be held. During the afternoon members will have the choice of alternative drives to (*i*) Dartmoor, *via* Dartmeet, Postbridge, Becky Falls and Bovey Tracey, or (*ii*) Widecombe-in-the-Moor, *via* Hay Tor Rocks, returning by way of Ashburton.

Torquay is almost entirely non-industrial: one of the greatest municipal assets is the electricity undertaking, upon which £670,000 has been expended. The electricity generating station is situated at Newton Abbot, and is to be visited by Convention delegates on Saturday, June 8th. A description of the plant will be found on the following pages.

It will not be inappropriate to refer to the local electric tramway system. The Torquay Tramways

Mr. J. W. Simpson,
The New I.M.E.A. Secretary.

Co., Ltd., inaugurated the service towards the end of 1906. There are some 11.5 miles of track in the town and the line was extended to Paignton in 1911, in which year conversion to the overhead system took place. Electric power for operating the system is purchased from the Torquay Corporation and also from the Paignton Electric Light & Power Co., Ltd.

Electricity Supply at Torquay.

A résumé of the activities of the undertaking at the seat of the I.M.E.A. 1929 Conference, with particular reference to the recently-opened extensions at the Newton Abbot power station.

THE Torquay Electric Lighting Order, 1891, conferred powers upon the Corporation to supply electricity within the borough. At the outset the choice of a site suitable for a generating station presented formidable difficulties on account of the peculiar configuration of the town, and it was eventually decided to establish the works in certain stores and cellars situated on the harbour side at Beacon Quay. The system of supply decided upon was single phase, 50 cycles, 200 volts. The first plant installed consisted of three 150-kW Willans generating sets and two Babcock & Wilcox boilers, 150 lb. per sq. in. and 500 deg. F. The supply was commenced in March, 1898.

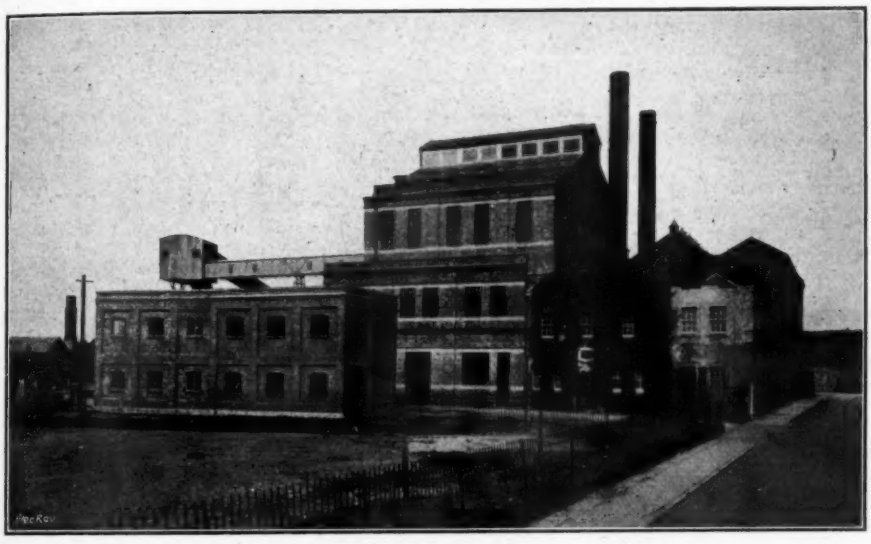


Fig. 1.—Newton Abbot Power Station; 18,000 kW.

From time to time various plant extensions were installed, and by the year 1920 effective generating plant of 3,000 kW capacity, consisting of two B.T.-H. turbo-alternators, each of 1,250 kW capacity, and one 500-kW set, had been installed. Owing, however, to the cramped boiler-house space, the maximum steaming capacity was only equivalent to 1,500 kW, without reserve, and the maximum demand had already reached that limit.

It was evident that no suitable site for a new power station existed within the borough, and therefore attention was directed beyond its boundaries. A site upon the River Teign, adjacent to the Great Western Railway Co.'s main line at Newton Abbot, was eventually selected as offering the requisite facilities for a larger station, and at the same time being situated at a centre suitable for the distribution of energy to neighbouring townships other than Torquay.

The town of Newton Abbot was supplied with electricity from a d.c. station of 520 kW capacity, owned by the Urban Electric Supply Co., Ltd., and situated close to the site selected by the Torquay Committee. It was decided to take steps to acquire the Newton Abbot undertaking, and to utilise the existing site, with certain additional lands, for the erection of the new station.

The purchase was effected and the Newton Abbot undertaking transferred to the Corporation in early 1923. The old Beacon Quay station was finally shut down in July, 1924. The Newton Abbot power station, fig. 1, after the completion of the recent alterations and extensions, which were officially inaugurated by the Mayoress of Torquay, Mrs. C. Geen, on May 1st last (Electrical Review, May 10th, p. 836), now contains generating plant of some 18,000 kW total maximum continuous rating. All the old company's original plant has now been removed, with the exception of the 600-Ah, D.P. battery which is still used with rotary convertors in connection with the works power supply. The original office buildings, which have been slightly extended, now provide accommodation for the fuel-, oil-, and water-testing laboratory, and for the local distribution staff. The new engine room now contains two 3,750-kW, and one 7,500-kW B.T.-H. turbo-alternators, the e.h.p. and l.p. switchgear and control room, and two B.T.-H.

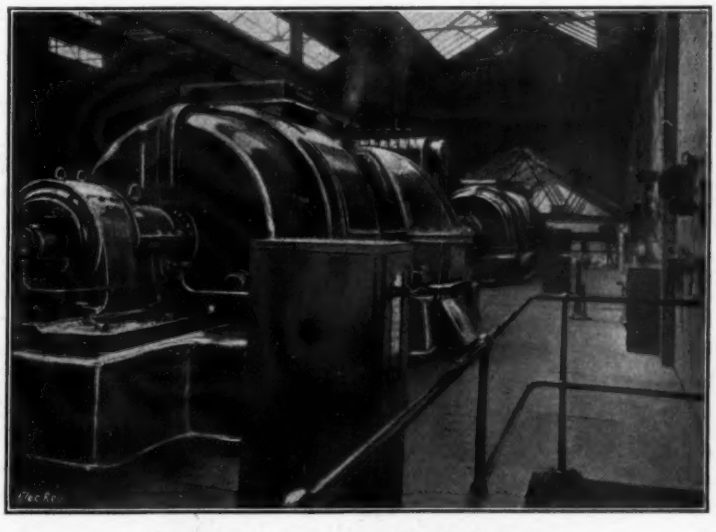


Fig. 2.—The 3,750-kW Turbo-alternators.

rotary convertors, each of 400-kW rating, for supplying the works power and a portion of the Newton Abbot d.c. network. The first section of the new boiler house parallel to the engine room contains four Stirling boilers with Green economisers, induced-draught plant, coal bunkers, elevator, &c. The working steam pressure for this first section of the new station was fixed at 150 lb.

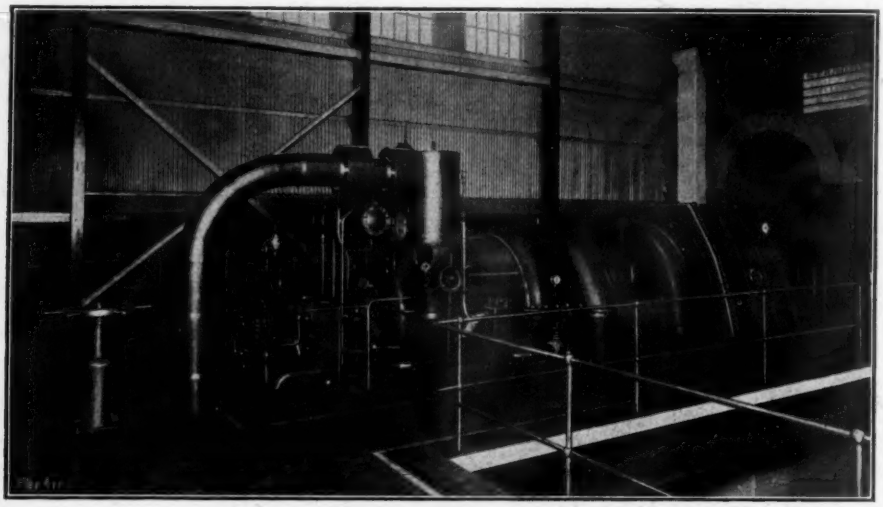


Fig. 3.—New Turbo-generator Set; 7,500 kW.

per sq. in., with a superheat of 150 deg. F., in order to obtain the benefit of the considerable saving in capital charges effected by the use of the old Torquay generating plant and the existing Newton Abbot boilers. The latest extensions of both boiler house and engine room are laid out at right angles to the original engine room, and the steam conditions have been raised to 250 lb. pressure and 650 deg. F. temperature. The h.p. and l.p. steam ranges are coupled by means of a Crosby reducing valve. The 3,750-kW turbo-alternators, fig. 2, were originally designed for the higher working steam temperature, and the two smaller machines, which were transferred from Beacon Quay, are supplied through British "Arca" de-superheating plant, which reduces the steam temperature to 500 deg. F.

The latest generating unit, fig. 3, is of 7,500 kW capacity, and, as in the case of the 3,750-kW machines, generates direct at the transmission pressure of 11,000 volts, 50 cycles. The pressure of the two smaller machines is stepped up from 2,200 volts to the transmission pressure. Circulating water is drawn from and returned to the River Teign by vertical-spindle pumps situated in two pump houses on the river bank.

Coal, which is obtained chiefly from the Forest of Dean, is delivered in trucks to the new railway siding, from which it is transferred to stock, or, alternatively, to the overhead bunkers in the boiler house by means of the recently-installed mechanical coal-handling plant. Ashes are removed by trucks from the basement of the boiler house and sold locally for building purposes. The boiler make-up water, which is obtained from the Torquay Corporation Water Department, contains no scale-forming or corrosive constituents, and is, therefore, used direct without any treatment other than the preliminary "boiling" which it receives in the exhaust steam-heated feed tanks.

The whole of the boiler-house plant was supplied by the Stirling Boiler Co., Ltd., and comprises six Stirling boilers of the five-drum type. The latest additions to the plant consist of two boilers, fig. 4, each of 7,437 sq. ft. heating surface, and capable of evaporating upwards of 40,000 lb. of water from feed water entering the economisers at 100 deg. F. to steam at 265 lb. per sq. in., superheated to a final temperature of 650 deg. F. These boilers are arranged as single units facing each other with passage ways on either side. Each of the steam drums is 42 in. in internal diameter by 17 ft. 1 in. long, and the water drums are 36 in. in internal diameter. Each boiler is fitted with a pair of chain-grate stokers by Messrs. Babcock & Wilcox, Ltd., 16 ft. by 6 ft., fitted with special narrow lap links for burning small coal and coke dust, of which latter fuel a considerable quantity is used. The superheaters are of the standard Stirling design.

The furnace arches are of the flat suspended "Liptak" type, and each boiler is provided throughout with "Diamond" jet soot blowers.

An economiser of Messrs. Green's manufacture is fitted immediately behind and adjoining each boiler. Mechanically-operated tube scrapers are fitted to each group.

Each boiler is also equipped with a "Sirocco" induced-draught fan mounted upon a platform situated above and behind the economiser. The speed of the fans is controlled by regulators mounted upon the firing floor. The gases discharged from the fan are passed through a "Sirocco" grit arrester, and thence into a short steel stack 60 feet high above the firing floor level and 4 ft. 9 in. in internal diameter. The steel-framed coal bunkers arranged above and between the two boilers are designed to contain 50 tons of coal when full, and are

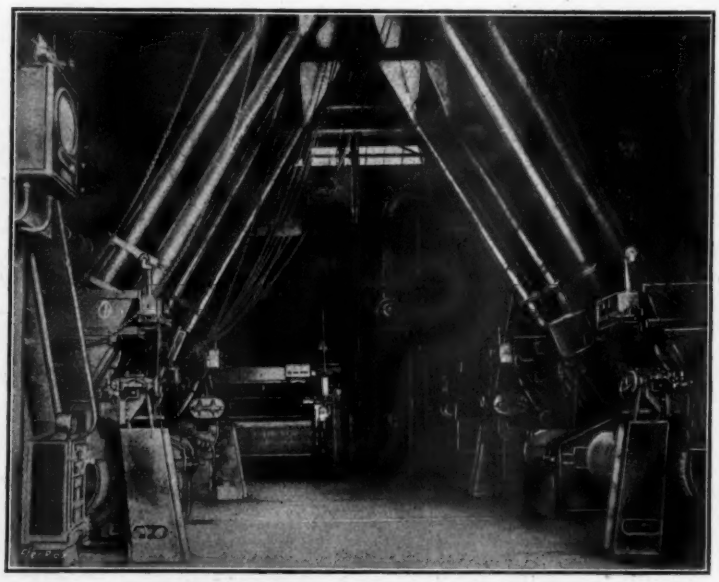


Fig. 4.—H.P. 40,000-lb./hr. Boilers.

divided into two compartments with a view to keeping coke dust separate from coal. Each class of fuel is delivered through a separate travelling cylindrical chute into the boiler hoppers, which are divided into compartments to enable the two classes of fuel to be fired on the "sandwich" system. Soot, ashes, riddlings and grit are delivered into their respective hoppers

below the firing floor, and are removed from the basement in steel wagons. A special instrument panel equipped with a Bailey boiler meter, distance thermometers and draught gauges is provided in connection with each boiler. Each boiler is provided with an automatic feed-water regulator of the Crosby pattern. The

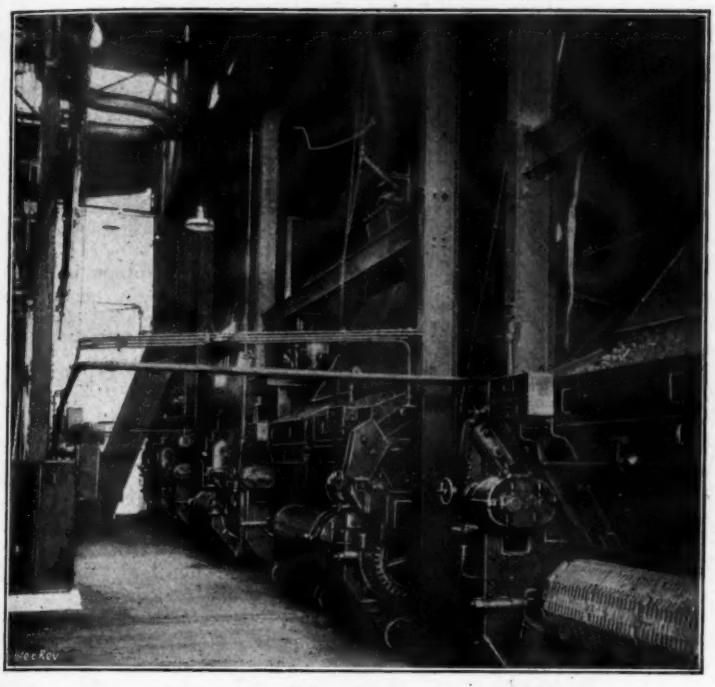


Fig. 5.—25,000-lb./hr. Boilers; 165 lb./sq. in.

remaining four low-pressure boilers, fig. 5, were installed in pairs, respectively, in 1924 and 1926. They are generally of similar design to the high-pressure boilers and are rated each at 25,000 lb. per hour evaporation. Each pair of boilers is served by one steel stack 90 feet high and 5 feet in internal diameter. The induced-draught fans for these boilers are situated in a special fan house in the basement below the economisers, and each is designed to deal with the gasses of two boilers at full load. Each of the four boilers is equipped with "Liptak" arches, soot blowers and instrument panels, as in the case of the two new boilers.

Telegraphs of the Chadburn ship type are installed for the purpose of conveying orders from the main control room to the boiler house and engine room. The feed pumphouse, which is situated in a bay between the boiler house and the latest engine-room extension, contains two sets of feed pumps and feed tanks for serving, respectively, the high- and low-pressure boilers.

The two turbine pumps which serve the h.p. boilers are of Messrs. J. P. Hall & Co.'s manufacture, and each is designed to deliver upwards of 120,000 lb. of hot water per hour. The two l.p. turbine pumps are of Messrs. J. & G. Weir & Co.'s manufacture, and each is designed to deliver upwards of 100,000 lb. per hour.

A 3-phase motor-driven pump by Messrs. Mather & Platt, Ltd., designed to deliver up to 80,000 lb. per hour, is so arranged as to be interchangeable between the h.p. and l.p. feed ranges.

The recently installed turbo-alternator was manufactured by the British Thomson-Houston Co., Ltd. Its maximum continuous rating is 7,500 kW, 90 per cent. p.f., 3,000 r.p.m., 3-phase, 11,000 volts, 50 cycles.

The guaranteed full-load steam consumption of the turbine is 10.7 lb. per kW at 250 lb./sq. in., 194 deg. F., 100 per cent. p.f. The total weight of the machine, exclusive of the condenser and auxiliary plant, is 95 tons. For the purpose of withstanding accidental short-circuit, the alternator has been designed to have an inherent protective reactance of 15 per cent. The voltage of the alternator is maintained constant within 1.0 per cent. variation by means of an automatic voltage regulator of the Tirrill type. The turbine is of the Curtis impulse type. The turbine casing at the h.p. end is of cast-steel, and at the l.p. end of cast-iron. The turbine is steam bled and the extracted heat is passed on to the condensed steam and then to the boilers in the usual manner.

The alternator is of the closed-circuit air-cooled type, the ventilating air being circulated by means of fans on the electrical rotor, and cooled by passing over a cooler of the surface type supplied with cold water from the condenser circulating system. A thermostatic alarm device is fitted to prevent overheating of the alternator in the event of failure of the cooling water. The exciter is of the shunt-connected commutating-pole type, and is mounted upon an extension of the bedplate.

The two 3,750-kW turbo-alternators which were in-

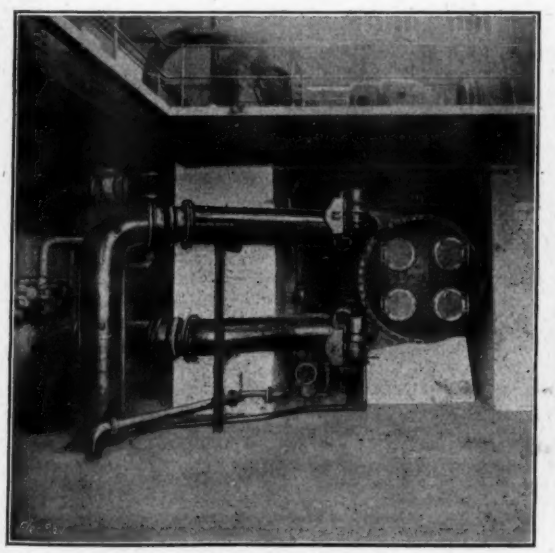


Fig. 6.—Condenser for 7,500-kW Turbine.

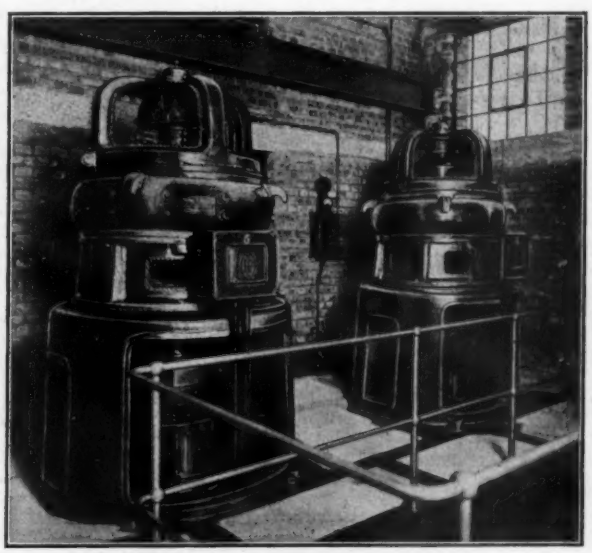


Fig. 7.—No. 2 Pumphouse Motors; 160 h.p.

stalled, respectively, in 1924 and 1926, as well as the two earlier 1,250-kW machines, are also of the British Thomson-Houston Company's manufacture. The rate of steam consumption of each of the 3,750-kW machines at full load is 12.89 lb. per kW (100 per cent. p.f.).

The condensing plant in connection with the new

Fig. 8.—E.H.P. Control Board at Newton Abbot.

7,500-kW machine, fig. 6, is of the horizontal surface type, and was manufactured by Messrs. Hick, Hargreaves & Co., Ltd. The air extraction is performed by a Hick-Breguet "ejectair," which consists of two steam jet ejectors working in series with an intermediate condenser. The "ejectair" is fitted with a special stabilising valve which automatically prevents the ejectors from becoming unstable at light loads. Extraction pumps are in duplicate and of the centrifugal type. They are directly-coupled to d.c. electric motors. The cooling-surface area of the condenser is 6,780 sq. ft., and the circulating water required to condense the necessary 64,100 lb. of steam per hour is 405,000 gallons per hour.

The condensing plant in connection with the 3,750-kW machines was manufactured by Messrs. Cole, Marchant and Morley, Ltd. The condensers of the two smallest machines are by Messrs. Mirrlees, Watson & Co.

Circulating water is drawn from and returned to the River Teign. The design of the circulating system presented considerable difficulty on account of the great seasonal variation of the depth of water in the river (amounting, according to flood, drought and tide, to as much as 17 feet) and also to the intervention of the confluent River Lemon between the main river and the power station. Two pumphouses situated on the river bank deliver circulating water to the condensers. No. 1 pumphouse, put into commission in July, 1924, contains three 40-h.p. vertical-spindle pumps by Messrs. Mather & Platt, Ltd., so installed as to be 3 feet below the deepest part of the river bed, and No. 2 pumphouse, which forms part of the recently-completed extensions and is situated up-stream of and adjoining No. 1 pumphouse, contains two 160-h.p. Mather & Platt vertical pumps, fig. 7, each capable of delivering upwards of 500,000 gallons of water per hour against a head of 50 feet.

Rotating-band screens by Messrs. Brackett & Co. are employed in conjunction with both pumphouses.

The railway siding and coal-handling and conveying plant (ELECTRICAL REVIEW, December 21st, 1928, p. 1,076) also forms part of the recently-completed extensions. There are three conveyors which elevate the coal to a total height of 70 ft. and convey it through a horizontal distance of 620 ft. The whole of the coal-handling plant was supplied by Messrs. Ed. Bennis & Co.

The e.h.p. switchgear which controls the generators, rotary convertors, and outgoing feeders is of the cellular type designed and manufactured by the British Thomson-Houston Co., Ltd., and is mounted in moulded stone cubicles erected on the engine-room basement floor, with sheet-steel hinged doors giving access at both front and back. Duplicate busbars mounted on compression-type insulators are provided, and the oil circuit breakers which are fitted with welded boiler-plate tanks for each phase are electrically operated from a vertical-type control board installed on the control room gallery above. The two main outgoing feeders to Torquay are fitted with the latest form of B.T.-H. balanced-current parallel-feeder protective gear, with definite time-limit overload relays. The neutral of the system is earthed through limiting resistances of the cast-grid type mounted on suitable porcelain insulators and enclosed in expanded-metal housings. These resistances can be isolated by means of oil circuit breakers which are electrically operated from the main control board. The d.c. switchboard is of the B.T.-H. vertical flat-back type and is installed on the same gallery as the e.h.p. control board, fig. 8. It is arranged to control the d.c. side of the rotary convertors, the 250-kW generator, the Newton Abbot town supply and the various auxiliary circuits of the power station. An illuminated board at one end of the control room shows diagrammatically the e.h.p. system supplied from the power station and the switching at all sub-stations.

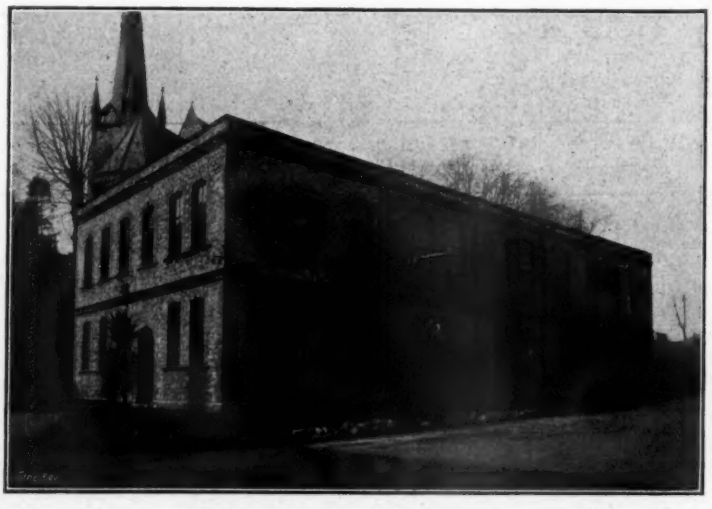


Fig. 9.—Upton Valley Sub-station.

The area over which the Torquay Corporation has distributing powers totals 193 sq. miles, including the area covered by an Extension Order now pending. In addition, supplies in bulk are given to the Paignton Electric

Light and Power Co., Ltd., and to the Teignmouth Electric Lighting Company, which together cover an area of some 150 sq. miles. The primary e.h.p. transmission is at 11,000 volts, and in consequence of the h.p. having been fixed originally at 2,200 volts at Torquay, that two incoming-outgoing ring-main feeders to Paignton, three rotary convertors for supplying the Torquay Tramways Co., and the various 3-phase-2-phase transformers which supply the Torquay 2,200-volt single-phase system.

Fig. 10.—Kiosk at Barton Village; 100 kVA.

Fig. 11.—Milber Village Kiosk; 100 kVA.

Fig. 12.—5-kVA Transformers off 2,000-V Line.

pressure has been retained for secondary transmission in the towns and adopted for local distribution in the rural areas. The borough of Torquay is supplied from the main sub-station situated in the Upton Valley, fig. 9.

The e.h.p 11,000-volt switchgear at the Torquay sub-station is of the B.T.H. compound-filled draw-out truck type. Automatic shutters are provided to enclose the live contacts when the truck portion is withdrawn. The equipment comprises 14 panels which control the two incoming feeders from Newton Abbot, the two e.h.p. feeders are fitted with B.T.H. parallel-feeder protective gear, and the transformers are provided with circulating-current protective gear. The 2,200-volt two-phase and single-phase switchgear at the sub-station consists of a moulded stone cellular structure mounted on a gallery on the opposite side of the building to the 11,000-volt gear. There are 12 outgoing single-phase feeder panels—six to each phase—and six two-phase transformer panels. The oil circuit breakers are remotely mechanically operated from a vertical black-

Fig. 13.—75-kVA Scott-connected Pole Transformer Station.

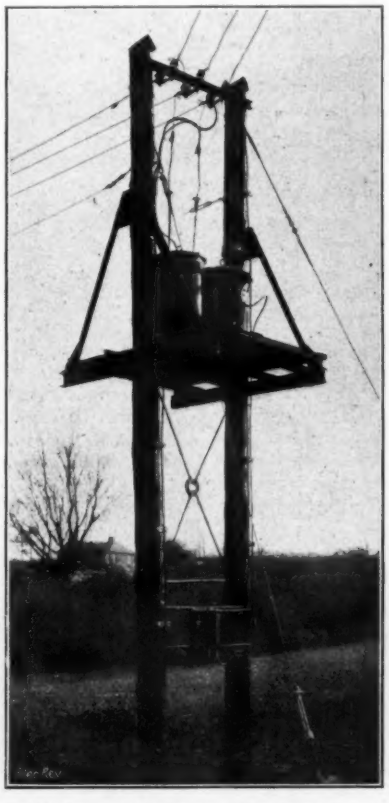


Fig. 14.—A Pole-type Transformer Station; 60 kVA.

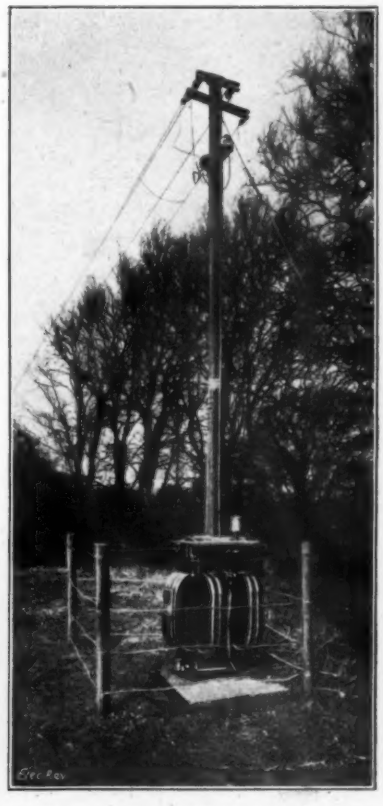


Fig. 15.—Supply Sub-station at Shiphay Village; 100 kVA.

enamelled control board mounted directly in front of the cells. The total installed capacity of 3- 2-phase transformer plant is 7,000 kVA, and of rotary-convertor plant 1,100 kW, in three units.

Distribution in the town of Newton Abbot was originally on the 3-wire d.c. system. With the exception of the main shopping centre, in which d.c. has been retained for special reasons, the distribution has now been converted to a.c., which is supplied from two main substations, one at the power station and the other at the opposite end of the town, each of which delivers energy into the 2,200-volt, 3-phase network. The remaining d.c. network is supplied through mercury-arc rectifying plant, and from the rotary convertors in the power station.

Extensive developments have already been made in respect of the supply of electricity in the rural areas, and the results already achieved are very encouraging. Supplies are ever being pushed further and further afield into more remote districts, and it is confidently anticipated that within three years from the present time supplies will be available throughout the Corporation's extensive and thinly populated rural area. Figs. 10 to 15 depict examples of the distribution work in the rural districts.

The whole of the scheme referred to above was carried out in accordance with plans and specifications prepared by Mr. H. F. G. Woods, M.I.E.E., borough electrical engineer, to whom we are indebted for the information and photographs.

Immersion Water Heaters.

Some practical results of the author's experience which are likely to be of value to contractors and electricity supply engineers who are anxious to improve their business.

By R. H. RAWLL, A.M.I.E.E., A.M.I.Mech.E.

IN order to improve their load factors most supply undertakings during the last few years have paid particular attention to the development of the domestic load. In the vast majority of cases this has been mostly confined to heating and cooking, but it is now being realised that this class of load possesses unfortunate peaks, which often coincide with the periods

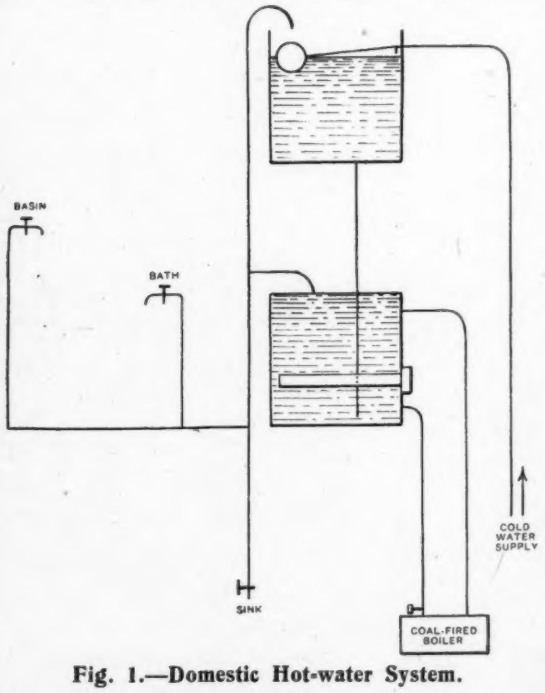


Fig. 1.—Domestic Hot-water System.

of maximum demand on the undertaking as a whole. Consequently, little or no improvement in load factor has been experienced.

For this purpose a load is obviously required which is more or less constant throughout the twenty-four hours of each day, especially during the night hours. It is well-known that low-loaded electric water heaters of the storage type admirably fulfil these conditions. Since an adequate supply of hot water is an absolute necessity in every home, it is obvious that here is a potential load which is not only ideal in character, but also capable of enormous development if the whole question is resolutely and courageously tackled on sound commercial lines.

Many supply undertakings are charging a very low rate per unit, being merely a fraction over the actual costs of distribution and generation, for current supplied to thermostatically-controlled water-storage heaters, which are often let out on hire. Such apparatus falls into two categories, viz., local and central storage. In the case of the former the heater is installed at the point at which the hot water is required, *e.g.*, over the kitchen sink or in the bathroom, while with the latter it is placed at a convenient central point and furnishes a supply to all the hot-water taps in the house.

In order to obtain maximum service with the local storage method in the average household it is necessary to have at least two such heaters installed, one at the sink and the other in the bathroom. With regard to the central storage arrangement, this usually necessitates a considerable amount of plumbing work and alterations to pipework, although, of course, this difficulty does not arise if such a method is decided upon while the house in question is being built.

It will be seen, therefore, that although these storage heaters are excellent as regards efficiency and performance, yet to the average middle-class household (and after all this is the class of the community to which electricity can be of the greatest service) both these methods involve considerable installation costs or alterations to the existing hot-water system, the latter being a very important point with the ladies, who usually have the last say in such domestic matters.

Now it is possible to apply electric heating to an existing coal-fired hot-water system in such a way that either method of heating can be put into commission separately or conjointly at will, and this also at comparatively small cost and inconvenience. The method referred to, of course, is to insert one or more immersion heaters into the hot-water storage tank, which is usually situated in the airing cupboard in the bathroom. Although admittedly not so efficient in performance as the properly designed storage tank, yet it is capable of giving surprisingly good results. By reason of the fact that either the old coal-fired or new electric heating systems can be worked independently of the other, the householder feels he is not definitely and irrevocably committed to the new method should the results not be satisfactory. In addition, where a coal-fired range with a boiler attached

thereto is utilised, it is usual to let the fire go out during the night, with the result that only a lukewarm supply of water is available in the morning on rising. In such a case if a low-loaded immersion heater is employed, which is put in circuit on retiring at night and switched off first thing in the morning, an adequate supply of really hot water is available for a morning bath or other domestic purposes. Also this alternative method of water heating has the advantage in that, although the average house may have an abundant supply of hot water

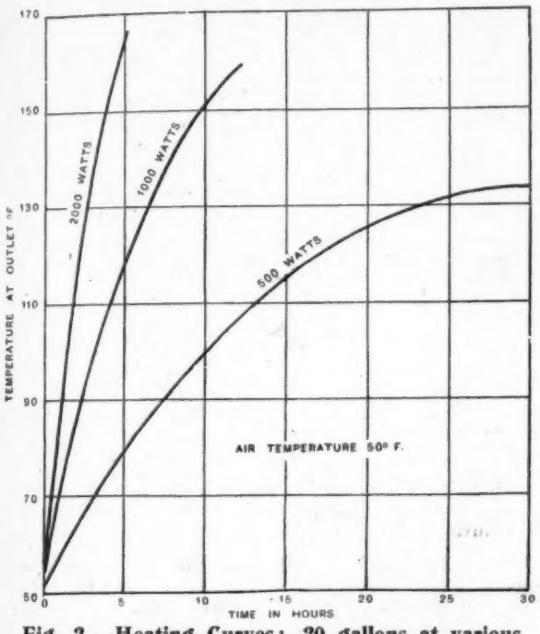


Fig. 2.—Heating Curves; 20 gallons at various Loadings, Tank Unlagged.

in the winter from coal-fired sources, yet often this convenience is denied to the housewife during the summer on account of the oppressive heat given out by such fires at this time of the year. In such a case the immersion heater can be utilised for the summer months only. The supply undertaking will also benefit by such an arrangement, in that a load of this character at such a period of the year would be most useful.

Fig. 1 shows diagrammatically the hot-water system in the average house. The position in which the immersion heater is fitted in the tank depends upon a number of factors. It must be remembered that only water *above* the heater will be heated. Consequently, the lower the level at which it is fixed the greater the quantity of water to be heated, and also the time required to raise it to a given temperature. The electrical loading of the heater and the possibility of lagging the tank are additional questions which must be carefully considered.

The best way to tackle the problem is to ascertain the maximum quantity of hot water which may be required at any one time. This quantity fixes the point in the tank at which the heater should be inserted, while the temperature rise required in conjunction with the period of heating at disposal will determine the loading of the heater.

Obviously each household has its own individual requirements as regards its hot-water supply, but the author has found that with a 20-inch cube unlagged tank of 30 gallons capacity, if an immersion heater with 3-heat control (2, 1 or ½ kW at will) is fixed one-third from the bottom of the tank, that is, at the 20-gallons level, it will give very satisfactory results. The rate of rise of temperature of the water for each of these loadings with such an arrangement is shown in the curves in fig. 2. The temperatures in these tests were taken at the hot tap on the wash-basin in the bathroom about 6 ft. from the storage tank.

Another method sometimes adopted is to have a low-loaded heater, about 500 watts, fixed fairly low down in the tank and another heater, about 2 kW, installed midway between this and the top of the tank. The former is normally in use, while the latter acts as boost heat for times of heavy duty. Usually the supply undertaking stipulates that the special low rate for water heating only applies to low-loaded apparatus which is on circuit for a considerable number of hours, including the night. In that case the low-loaded heater can be connected to the special water-heating meter, while the booster is fed from the ordinary house heating circuit and charged accordingly.

There are various types of immersion heaters. For example, there is the flat-blade variety, which consists of an element wound on mica and then inserted in a metallic water-tight envelope. The disadvantage of this type is that usually the water joint into the tank has to be broken in order to withdraw the heater should a fault take place in the element. Then there is the cylindrical type, which comprises a spiral element wound round a porcelain former, the whole being placed in a nickel-plated copper container. The advantage of this type is that by removing two nuts the heater portion can be drawn out for inspection without breaking the water joint, and without the consequent inconvenience of having to drain the whole hot-water system.

With regard to the actual fixing of the immersion heater into the tank, unless the electrical fitter doing the job has had previous experience of installing such apparatus, it is the wisest policy to call in a proper plumber to carry out this part of the work. First of all, the storage tank must be emptied of water. To do this, the water supply to the cold-water cistern is first turned off, and then all the hot water taps in the house are opened it is assumed, of course, that the fire in the range is not alight.) When the water ceases to flow from these points it is a mistake to assume that the storage tank is empty. It will be seen from fig. 1 that the hot-water delivery pipe to the various taps is connected to the top of the storage tank, and, consequently, as soon as the water falls below this level, due to no make-up water flowing in from the cold-water cistern immediately above it, no more water can escape. The next step is to remove the draining plug fitted for this purpose, usually at the lowest point of the circulation pipes adjacent to the range boiler. This is often fixed in a most inaccessible position, near the skirting board, for instance. It must be remembered that there is still a considerable quantity of water present, about 30 gallons, with a head depending upon the difference in level between the range and the storage tank, which is usually upstairs. Persons in ignorance of this fact have been treated to a regular aquatic display on removing the draining plug, particularly when it is situated in a living room. The easiest method of tackling this is to procure a length of hose-pipe, one end of which is placed by a convenient drain, while the other has a large funnel attached to it which is placed against the plug, which is then removed.

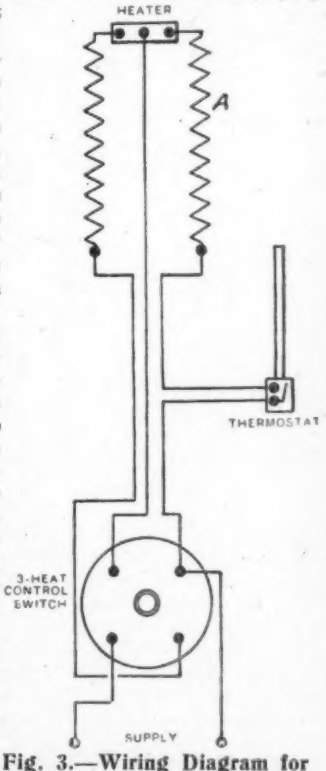


Fig. 3.—Wiring Diagram for Immersion Heater with Thermostatic Control.

It is a wise plan to take this opportunity of substi-

tuting the ordinary draining plug by an adjustable valve or tap, so that in future if any further draining operations have to be carried out for any cause, such as cracked pipes due to frost, &c., they can be effected quite easily and conveniently. The cock of such a valve or tap should require a removable spanner or key to operate it, in order to prevent accidental opening of the valve.

It may be mentioned here in passing that in some old houses it is the practice to feed the hot-water tap in the kitchen or scullery from the circulation pipes to the range boiler. Since with the immersion heater method of water heating no circulation takes place in these pipes, no hot water will be available at this point, so care should be taken to ascertain this information before deciding to instal an immersion heater in such circumstances.

The storage tank having been emptied, it is now necessary to cut a hole in it to receive the immersion heater. With some makes of heaters it is necessary to remove the manhole cover in order to do this. In the case of tanks which have been in commission a number of years, there is often considerable difficulty in doing this, and in any case the cover must be recaulked when replaced. There is, however, available a patent flange, into which the immersion heater is screwed, which can be fitted into square or round tanks without necessitating the removal of the manhole cover.

With regard to the wiring, it is best in the interests of safety to fix the control switch, whether plain " on and off " or 3-heat, outside the bathroom. Owing to the fact that the terminal blocks of immersion heaters when in use generally attain a fairly high temperature, this often causes the rubber insulation of the conductor wires to perish and become brittle where they are in close proximity to the blocks. For this reason it is most advisable to strip the conductors bare a few inches from the terminal block, and thread over them heat-resisting porcelain beads. As regards earthing, *all* the pipes emanating from the storage tank should be securely bonded together and to the water supply pipe which feeds the cold-water cistern, by means of stout copper wire and proper clips. It is very advisable to ascertain that this supply pipe is metallically continuous to the main, and its efficiency as an earth connection should be tested if any doubt exists on this score.

In order to increase the thermal efficiency, this can be greatly improved by lagging the storage tank. The lagging should be of such a nature that it does not encourage moths, on account of the clothes in the airing cupboard. Also, in order to provide sufficient heat for the airing process, it will usually be found necessary to leave the top of the tank unlagged.

The practical results of the author's own experience may possibly be of interest. The heater is switched on at low heat (500 watts) on retiring at night and switched off after luncheon the following day. This provides sufficient hot water (130 deg. F.) for toilet purposes on rising and for other domestic uses during the morning, and the water is still sufficiently hot for washing up after the evening meal. By working the element at " low " heat means that it is running at a black heat, which prolongs its life. The average consumption per week is 52 units. (If the tank was lagged and thermostatically controlled a considerable economy in current consumption and increased temperature could, of course, be obtained.) The cost of the installation was approximately £5 15s.—heater £2 10s., and wiring, fitting, &c., £3 5s.

If a thermostat is utilised, this should be fixed near the top of the tank. Fig. 3 shows a 2-kW immersion heater with 3-heat and thermostatic control. Since that portion of the element marked A is always in circuit whether " high," " medium " or " low," if the thermostat is connected in its circuit automatic temperature control is obtained on either 1 kW (medium) or ½ kW (low) loading. The 2 kW (high), of course, is only for use when the temperature is required to be raised rapidly.

It is hoped that these few remarks may be of interest and use to those contractors who wish to take advantage of this new business outlet, and also to supply engineers who are anxious to develop their water-heating load.

Textile Plant Electrification.

Some aspects of mill and factory driving, for which purpose the electric motor is particularly advantageous.

By CLIFFORD CARTER.

THE axiom has been formulated that schemes for the electrification of textile mills and factories which are old, but compact and well planned, are not as a rule worth while; but that if extensions of any magnitude are called for, or in the design of a new factory, electrical transmission should be employed. The correct choice of drive for any particular situation depends entirely on the circumstances surrounding it. Every case must be considered individually if the best results in efficiency and reliability are to be obtained. Points to be considered include the peculiarities of the machines to be driven and also external conditions, such as climate; in India, for instance, an increase in temperature often influences the power required by altering the tension of ropes, belts, and spindle-driving bands.

An objection which is sometimes raised against electric driving is that the efficiency of a mechanical drive is considerably higher than that of an electrical one, which is a very difficult accusation to disprove. The actual efficiency of an electrical system of driving may be easily ascertained, but the efficiency of a mechanical system under running conditions is impossible to obtain with accuracy. It has been found, however, that when a textile mill has been converted from a mechanical drive to an electrical one, the indicated horse-power of the prime movers has been reduced with the same machinery running, which fact certainly tends to show that the efficiency of the mechanical drive is not usually so great as is stated to be by its advocates. The probability is, however, that as between a well laid-out electrical drive and a perfectly modern mechanical drive there is very little difference indeed in the actual efficiency of transmission; that is to say, as regards the total power delivered to the machines by the driving mechanism. This does not dispose of the fact that the motors deliver the power in a better manner; that is, at a more constant speed.

Steam-turbine Mill Drives.

The prime mover is, of course, the starting point of all transmission schemes. When the textile manufacturer of to-day decides to put down his own power plant he has, in practice, three types of prime movers to

choose from : (*a*) the modern reciprocating steam engine; (*b*) the steam turbine; and (*c*) the Diesel or semi-Diesel engine, which is ideal for small and moderate loads. For installations above, say, 300 b.h.p., the choice lies between the steam engine and the turbine. The latter is a prime mover particularly well adapted to the requirements of a mill driven electrically; it is smaller and lighter than the reciprocating engine; it can be housed in a smaller building and requires lighter foundations than its rivals; assuming that a good vacuum is maintained and that the size of the set is not too small, its power costs are lower also. The steam turbine is a prime mover which possesses the property of utilising a high vacuum far more efficiently than can be done by a reciprocating engine. In existing mills and factories the conditions may be such that both smoothness of drive and convenience of operation may be obtained by the installation of a steam turbine connected to the main driving shaft, or rope pulley, by means of double helical reduction gear. In some instances such sets are fitted with a generator, connected to the low-speed shaft, from which electricity may be fed to motors arranged to drive machinery in outlying buildings. A feature of the turbine drive which frequently proves of great importance is the facility with which the turbine may be arranged to pass out a quantity of steam, after it has done work in the higher-pressure stages, to be used for heating or manufacturing purposes.

If desired, the arrangement may be such that all the steam used in the turbine may be utilised. As an alternative, steam-turbine sets are sometimes installed to relieve overloaded steam engines. The turbine takes exhaust steam from the engine, and the arrangement is such that the engine is relieved of its overload, the overall output of the plant being increased considerably.

It should be noticed that both turbines and electric motors invariably give a fine steady rotary drive, thus doing away with the cyclically jerky uneven turning moment that is unavoidably characteristic of the reciprocating engine. It has been found that a small cyclical irregularity of 2 to 3 per cent. in a reciprocating engine is quite commonly increased in mechanical transmission by gears, ropes, belts, chains and shafting, between the engine and the driven machine to as much as 20 per cent. Turbines have a good starting torque, and in the case of mills are quite capable of starting the Monday morning friction load.

Briefly, so far as power production on a large scale is concerned, the steam turbine is supreme, although under certain conditions water-turbine drive may be a serious competitor. With a plentiful and constant supply of water there are instances of textile machinery being driven by separate small water-turbines, neither belts, ropes, nor electric motors being required. Usually the development of water power involves a disproportionate capital expenditure and the power developed is frequently subject to seasonal variations which seldom synchronise with the load.

Generated versus Purchased Power.

In many instances the power required for a mill *must* be generated on the site, whilst in a steadily increasing number of cases a public supply undertaking is available from which electrical energy may be purchased. An analysis will show that in most cases a mill of moderate size can generate and apply its own power more cheaply than it can purchase it in the form of electrical energy. On the one hand, when energy is purchased from a supply station, the prices charged must naturally cover a profit, both on the cost of the steam plant for generating the electricity and the heavy outlay on cables for transmitting it, in addition to the losses due to transmission through cables from the generating station to the customer's works. On the other hand, the convenience and indirect economies of purchasing the ready-made article become daily more obvious, and the decision might be in favour of a public supply for a new mill near to a large power station requiring motive power only. The ultimate decision should only be made after the fullest investigation, preferably carried out by an independent consultant who is in a position to give equal consideration to all factors without bias.

Group or Individual Driving.

To obtain the maximum benefits from electrical driving, it may be said generally that separate motors should be installed to drive each individual machine. Undoubtedly this is the modern tendency, particularly so in the case of new mills in which the absence of shafting makes possible a much lighter and less costly construction of buildings. In many cases, however, the extra cost of individual motors may be considered commercially inadvisable, and group driving may be resorted to. This practice is frequently adopted when steam-driven mills are converted to electrical drives, existing line shafting being retained. If the group system is adopted, it should be so arranged that each group requires approximately the same power. If possible, the motors should be coupled direct to the line shaft, while where long line shafts are employed the motor should be placed in the centre. Motors may be actually located upon the machines, thus eliminating all belts and flexible factors in the power system, and applying direct and positive power to the machines at a constant rotative speed. Where motors are directly applied to the machines the improvement in the quality and the amount of the product, as well as the decreased attendance, is very marked. The design of many jute mills is such that it is possible and practicable to place motors over the centres of the shafts they have to drive, connecting them to these shafts by chains, the motors themselves being suitably housed in a simple superstructure raised on a flat roof. If placed at the ends, the motors are in the clean atmosphere of the alley-way, but the speed irregularity of the shafts may be excessive, particularly if the shafts exceed, say, 300 ft. in length, as they do in many Calcutta mills where at least one shaft 700 ft. long is installed. The modern method of driving jute preparing and spinning machinery rooms is to run the shafts at 485 r.p.m. (softener and card shafts being sometimes run at a lower speed) and to couple the motors direct to the shaft through flexible couplings. In a modern drive, the motors are often placed on masonry piers connected together by a platform, with motor starters on the ground.

It is submitted, as a general rule, that if a textile or other machine runs intermittently or requires complicated shafting to drive it, individual driving is to be preferred. Individual electric driving should thus be applied to dressing machines and to damping machines which run intermittently, and to calenders and mangles which provide an irregular load. Cropping machines, measuring machines and calenderoys, and, indeed, all machines which do not run continuously should also be put on single-motor drives. The individual electric driving of calenders with chain transmission has proved very successful in practice, as has also a similar motor arrangement with gear or worm drive.

Modern Mill Motors.

Very special consideration is required in the design of motors for spinning mills, and a great deal of experiment has been necessary for the evolution of the best prevailing types. Three-phase squirrel-cage motors as first used to drive spinning and twisting frames when electric driving was first introduced were not satisfactory, as they started in much too jerky a manner, causing yarn breakages. A further disadvantage of these motors was their big initial current rush, equivalent to approximately six times the normal current. This current rush brought about undesirable pressure fluctuations, especially where the system had to supply both light and power.

The so-called star-delta connections for reducing the starting current could not be employed, as the direct operation of spinning and twisting required a starting torque of nearly twice the normal, and motors initially connected in star do not, of course, start satisfactorily. Three-phase squirrel-cage motors with pole change-over devices for two speeds employed later showed the same

defects. The two speeds obtained by the pole change-over principle lay too far apart, so that these motors also did not suit the technical requirements of the spinner. These disadvantages have now been eliminated, however, and motors have been introduced which give a wide variation in spindle speeds to suit start up, finishing and yarn changes. The bearings of motors supplied for preparing and spinning rooms should be absolutely fly proof. For wet spinning-room work the motors should be fully enclosed machines with air-ducts circulating the outside air and not the humid atmosphere of the room. The windings are thus kept dry and fully insulated.

Independent driving has been especially satisfactory when applied to spinning frames, which machinery must usually be started slowly. Useful variations in speed may be obtained with an individual direct current motor, the regulation of speed being left to the spinning master, who may be given a bonus on turn-off. Thus if the weather is propitious for spinning, or if he has a good spinner on a frame, he may increase the speed and consequently the production. A higher speed than the normal might also be given to the frame when the bobbin is half-full, as it is at this time that the spinners' work is lightest. An individual direct current motor drives a spinning frame most conveniently through a small pinion upon the end of the armature spindle, meshing into an internally toothed wheel upon the end of the cylinder shaft. Motors for spinning frames should have twice the normal torque.

Weaving-factory Drives.

In determining the best type of drive to be adopted for any loom, it is desirable to consider briefly the duties to be performed. First comes the duty of starting from rest, when to overcome inertia of the moving parts and to impel the shuttle smartly across the loom, up to or over three times full-load torque may be required. Next may be taken the operations of shedding, picking and beating up. During each cycle of these operations the torque required from the motor shaft has been found by careful investigations to vary from zero to a maximum, when picking up two or over more than three times full-load torque. Another important condition which must receive careful consideration is the " bang-off " or sudden stoppage of all moving parts that occurs automatically should the weft break, the supply of thread in the shuttle give out, or should the shuttle for any reason fail to get across the warp shed in time. When a loom bangs off, the momentum of the moving parts is so great that the sudden stoppage throws a heavy shock upon the loom frame and upon the driving motor and upon the belt, chain or gears. To prevent damage being caused by this shock, provision must be made either by allowing the belt to slip, or, in chain- or gear-driven looms, by including a slipping clutch. Also in the heavier looms a brake is usually fitted that is applied automatically when a loom " bangs off." A final condition to be noted is that the picking action of striking the shuttle across the warp, say, some 200 times a minute, is liable to cause vigorous vibration in the loom when gear drives are employed, and is liable to affect the gears detrimentally unless adequate precautionary measures are taken to the contrary. From the above analysis, which outlines the principal difficulties to be overcome, it will be seen that to provide a satisfactory combination of a suitable motor with a suitable drive to suit each different type of loom is by no means a simple problem.

In a belt-driven shed the speed of any particular loom will be dependent upon the number of looms working from the countershaft at any instant. Thus, due to risks of broken ends such a loom cannot run at the highest possible speeds, but must be operated at an average number of revolutions to allow for its speeding up when other looms are shut down. With individual drive, however, the speed of any motor is independent of the starting or stopping of other motors, consequently a loom so driven can run at a higher speed than a loom driven from a countershaft, the output of the loom being thus increased. In fact, as the looms run at their theoretical maximum speed their output will be a maximum. This is the greatest advantage to be obtained from the use of an individual drive, and although very extravagant figures have sometimes been put forward, it has been found that as a rule the adoption of such a drive will increase the shed's output by approximately 10 per cent. Again, due to the constant speed, the fabric will be more evenly woven than would be a fabric produced from a mechanically-driven loom. Mr. J. F. Crowley has published comparative tests taken over a period of twelve months between some hundreds of looms running on hessians and sackings, and driven mechanically by a modern reciprocating engine and a similar number of looms driven by individual electric motors. The individually driven hessian looms showed an increase in production of 13 per cent., and the sacking looms an increase of 8 per cent. over their mechanically driven neighbours. The jute loom requires a high starting torque usually from two to two and a half times the normal torque, and has a particularly irregular power cycle. The speeds of jute looms vary from 90 picks per minute to 180 picks per minute, depending on the reed space. The average power taken by a group of looms, allowing the usual load factor for weaving sheds, varies from 5 b.h.p. to 2 b.h.p. per loom. The load factor or weaving efficiency of a jute shed varies from 45 per cent. to, in the very best cases, slightly over 70 per cent., depending upon the class of material woven and the type of operator.

Two-loom Belt Drives.

In some weaving sheds a single continuously running motor is installed for each pair of looms, belts being taken from double-width pulleys at both ends of the motor to fast and loose pulleys arranged on each loom, so that the belts are nearest the motor bearings when on the fast pulleys. Compared with the individual drive this arrangement requires a smaller capital outlay, but involves greater losses, because of the continuous running and less even loading of the motor, and does not give the maximum output obtainable with the individual high speed clutch drive, using either chain or gears.

Individual Chain Drives.

In some instances, chains are substituted for driving belts using an adjustable frame motor, but omitting the spring and adding adjusting nuts above and underneath the projecting lug on the motor body. Chains may be used for speed reductions up to 6 or 7 and give the important advantage of a positive drive. They avoid the slip experienced with belts that occurs every time the loom is started, and so avoid a consequent important loss of production. On the other hand, in order to protect both the chains and the driving teeth against risk of injury when looms bang off, some definite slipping device must be introduced. This requirement is met by the provision of friction clutches. The best arrangement is to have a high-speed clutch mounted directly on the shaft of the motor. This is to be preferred to a clutch mounted on the low-speed driven shaft.

Integral Mounting.

In practically every type of loom it is possible to fit brackets whereby both motor and starting switch can be mounted as part of the loom itself. This arrangement not only avoids encroaching upon the floor space of the shed, incidentally making for greater cleanliness, but also minimises the injurious effect of vibration upon the teeth of the gears. Having in mind the hammer-like blows given to the shuttle, say up to two hundred times a minute, and the inevitable consequent vibration, the advantage of having the motor with its driving pinion bolted securely to the same framework that carries the driven spur wheel will be at once apparent.

In some looms a low-speed mechanically arranged clutch is incorporated by the makers in the structure of the loom, when the driving pulley or individual motor must run continuously. This type of loom drive has the disadvantage that the motor consumes electrical energy when running unloaded whenever the loom is

stopped, and as stoppages frequently aggregate 30 per cent. of the total working hours, the cost of idle running may amount to an appreciable total per annum.

Group Drives for Looms.

Whilst to obtain the maximum benefits from the electrical driving of looms it is necessary to install individual motors, there are frequent instances where this course is considered commercially inadvisable, and where some form of group driving is adopted. This practice applies particularly in the conversion of some factories from steam to electric driving, when the individual drive would necessitate expensive rearrangement of existing looms. Various types of motor can be supplied for group driving, the types most commonly employed being either ordinary or high-torque high-efficiency squirrel-cage motors, or slip-ring motors, and arranged either as enclosed-ventilated or pipe-ventilated machines, according to circumstances. In some instances, however, it may be possible to use either slip-ring motors in conjunction with phase advancers, or, alternatively, synchronous induction motors, in order to obtain reduced charges for electrical energy by improving the power factor of the system. The more intermittently machinery works the greater the advantage of a direct electrical drive. For instance, with Jacquard looms, where there are often prolonged stoppages to tie up new harnesses, there is more advantage in individual drive than with looms weaving plain staple goods. For the latter, group driving would be more acceptable.

Electrical Devices.

That there is a great future for the application of electricity to the requirements of the textile industry cannot be denied. It is certain that as electricity is increasingly used for driving purposes its application to other mill uses will increase through the efforts of the user quite as much as through those of the electrical engineer. In practically every branch of the industry, from the treatment of the raw fibre to the finished fabric, there is a tendency towards the application of electricity in some form. Electrical means have been proposed to remove metal from raw material, as it has been proved by statistics of fire insurance companies that a large percentage of mill fires is attributable to pieces of iron in the fibre. To remove them an electro-magnetic cylinder is rotated over the feed sheet in such a way that the surface speeds are similar. As soon as the pieces of iron come within range of the magnet they are attracted to the magnetic cylinder and carried away and automatically dropped into a receptacle by the sudden cutting off of the current.

A good British electrically-driven yarn tester which is now widely used is operated by an electric motor with direct drive by means of suitable reduction gear. Regularity of the stress load is maintained throughout the test by this method, thus eliminating any possibility of jerky revolutions which place a sudden strain on the yarns, and make a true and accurate test impossible.

Apart from electrical driving, electric warp and weft stop motions have been known for several years. In a recent patent, for instance, the loom handle is normally prevented from being pushed by a spring-actuated lever into the off position by an armature attracted to an electro-magnet which is constantly energised by a winding in circuit with the mains. A reverse winding on the electro-magnet is normally in a circuit interrupted by the attraction of an armature to an electro-magnet having a winding fed from the low-pressure secondary side of a transformer.

When a warp thread breaks the corresponding detector closes a circuit including a neutralising winding, whereby the second armature is allowed to make contact to allow current to pass through the reverse winding. The other armature is thus released from its electro-magnet and a spring moves a plunger to move the handle into the off-position to stop the loom.

In the ordinary electric stop motion the breaking of a thread causes the flow of an electric current to an electro-magnet, and the movement of the armature of this magnet draws together the jaws of an arrangement for gripping the broken thread. Owing to the vibration of the machine these jaws are frequently shaken apart and the thread released. A new device has been patented in which by means of a spring and an elastic band connected with the electro-magnet, a bolt is made to pass through a hole in a paddle attached to the movable jaw, and the gripping device is thus locked mechanically. At the same time the current circuit is broken and overheating prevented. Several attempts have been made to perfect electrically-operated jacquards, but the difficulty is that an electrical contact sufficient for operating a part cannot be obtained from a mere touch. By the use of single-phase current the Carver electrical jacquard has been improved into a practical device, which has been adopted in Belfast damask factories.

Electric baling presses, cloth cutters, conditioning ovens, hydro extractors, pumps, cranes, winches and hoists, are but a few examples of electrically-operated mechanism now in use in modern textile mills. There is still a great deal to be learned with regard to mill and factory electrification, but there is no doubt that every new mill and factory will be electrically equipped, and it is equally certain that these mills and factories will be able to pay dividends when a good many steam-driven plants will be unable to do so.

Empire Mica Production.

A correspondent in the special Empire Products Section of last week's *Times Trade and Engineering Supplement* states that although the world's principal supplies of mica still continue to come from India, Canadian and South African production during the last few years has rapidly approached the Indian output. Fifteen years ago India was responsible for some three-fifths of the world's total production, most of the remainder coming from the United States, Canada, and what was then German East Africa. The East African deposits are still worked, though without any great influence on world output. Other sources are Ceylon, Australia, and Southern Rhodesia. In 1928 exports of mica from India totalled 4,774 tons (against 3,874 tons in 1927). Canada's production amounted to 4,040 tons (against 3,005 tons), and South Africa's to 3,629 tons (against 1,660 tons). The Canadian mica is the variety known as "phlogopite," or amber mica, which is softer, more flexible, and a better insulator than the "muscovite," or white mica, found generally in other countries. The main deposits are in Ontario. Nearly all the Indian mica which comes on the market is muscovite of the highest quality, the principal areas of production being in Bihar and Orissa and Madras. The mica from the Bihar belt is generally of a ruby colour, while that from Madras is green. Canada, Ceylon, and Madagascar are the only countries in which amber mica is found in economic quantities. The Northern Transvaal has a muscovite mica field of great promise, extending over some 300 square miles in the Pietersburg district, but its development has been retarded in the past owing to its remoteness. A small railway which now connects the mica-bearing belt with Delagoa Bay has already made possible a great increase in exports, which may make South Africa the world's most important source of muscovite mica.

A Committee on Patent Procedure.

The President of the Board of Trade has appointed the following committee to report whether any, and, if so, what, amendments in the Patents and Designs Acts, or changes in the practice of the Patent Office, are desirable:—The Rt. Hon. Sir Charles H. Sargant (chairman), Mr. Horatio Ballantyne, Mr. H. A. Gill, Mr. E. H. Hodgson, C.B., O.B.E., Sir Herbert Jackson, K.B.E., F.R.S., Mr. W. S. Jarratt, Mr Fearnley Owen, Mr. J. G. Weir, C.M.G., and Mr. James Whitehead, K.C., with Mr. R. W. Luce, Patent Office, 25, Southampton Buildings, Chancery Lane, W.C.2, as secretary.

Business and Industrial Notes.

The Week's Electrical Trade News from all Sources. Commercial and Industrial Developments, Business Changes, Market Prices for Materials, Trade Openings, New Publicity Literature, Liquidations and Failures.

The A.S.E.E. Apprenticeship Scheme.

It may be recalled that in October last we published some details of an apprenticeship scheme evolved by the Association of Supervising Electrical Engineers. It was proposed that the scheme should operate under the control of a Central Apprenticeship Board representative of the various interests in the electrical industry. The training suggested linked up practical and technical work, and the co-operation of employers was essential to its success. It was pointed out at the time that it would be necessary for many conversations to take place between the promoters and those organisations in the industry which would ultimately control the scheme. We are now informed that a number of the organisations concerned have expressed their deep interest in the fundamentals of the scheme, and meetings are being arranged with those who have not yet arrived at a definite decision. Three of the six bodies have signified their favourable attitude. It was to be expected, however, in view of the many schemes which are already in operation, that difficulty would be experienced in finding common ground for the linking-up of the ideas underlying present schemes, with the new suggestions. One of the reasons behind the suggestions of the A.S.E.E. was to bring about, by co-ordinated effort through the co-operation of all who had the question of apprenticeship at heart, a scheme which would relieve the industry of the unfortunate position in which it is placed in regard to apprenticeship systems. Headway has been made, and, providing all interests are prepared to sink their individual outlook for the good of the industry, there is no reason why such a scheme should not be evolved from the suggestions put forward by the A.S.E.E. which would guarantee, in the future, a supply of fully-qualified men for the electrical industry.

Government Mission to Argentina and Brazil.

Last week the Board of Trade announced the appointment of an economic mission to visit Argentina and Brazil and consider the industrial, commercial and financial relations of those countries and Great Britain with a view to their development in the general interest. The members of the mission are Lord d'Abernon, president; Sir William Clare Lees, representing the textile industries; Mr. G. E. Rowland (president of the Agricultural Engineers' Association), representing the engineering industries; and Mr. Julian Piggott, iron and steel industries. The mission will be accompanied by Mr. H. O. Chalkley, Commercial Counsellor at the Buenos Aires Embassy, and Mr. H. W. Wiswould, Department of Overseas Trade, will act as secretary. Prior to leaving this country the mission will make a preliminary survey in this country of questions affecting trade between Great Britain and Argentina and Brazil. For this purpose the co-operation is sought of Chambers of Commerce, trade associations, firms and individuals interested in the subject. Communications for the mission should be addressed to Mr. Wiswould at 35, Old Queen Street, S.W.1.

New Electrical Showrooms.

New showrooms and offices erected in Parliament Row, Hertford, by the North Metropolitan Electric Power Supply Co., were opened on May 10th by the Mayor, Sir Lionel Faudel-Phillips.

The Portsmouth Corporation Electricity Committee is recommending the acquisition of property at London Road, North End, at a cost of £5,300, for the provision of showrooms for the department.

Employment during April.

According to the May *Ministry of Labour Gazette* employment in the engineering industry remained quiet on the whole during April, but showed a further improvement in most districts. It was fairly good in electrical engineering, although there was a decline in that section. The number of persons unemployed in the engineering industry at April 22nd was 78,181, the proportion falling from 8.1 to 8.0 per cent. The number of unemployed in the electrical engineering branch was 3,878, and the proportion rose from 4.7 to 4.9 per cent. There was a slight increase in the percentage of unemployed in the electric cable, wire and lamp manufacturing group—from 6.0 to 6.1 per cent., the number of unemployed being 5,289. In the electrical wiring and contracting industry the number of unemployed fell to 1,095, and the proportion from 8.0 to 7.9 per cent.

Westinghouse Agreement with French Company.

The Westinghouse Company has concluded an agreement with Schneider & Co., one of the leading French industrial concerns, for the formation of a joint electrical manufacturing company in France, with a capital of $4,000,000 (£800,000).—*Reuter* (New York).

The Economic Mission to Australia.

On Thursday last week members of the Economic Mission which recently returned from Australia were entertained at luncheon by Mr. G. E. Rowland, president of the Agricultural Engineers' Association. The toast of "The British Economic Mission" was proposed by Sir Edward Crowe, Controller General of the Department of Overseas Trade, who congratulated the members of the Mission on their work, which, he emphasised, was not for themselves but for the Empire. In the course of his reply, Sir Arthur Duckham (leader of the Mission) said that Australia possessed tremendous possibilities for development which, if realised, would mean more trade for the whole of the Empire. He made particular reference to the place of agricultural machinery in that development, and expressed the hope that British, and not American, lines would be followed. He believed that Australians wished to develop along British lines, and British manufacturers should do their utmost to secure a position in the market. Sir Hugo Hirst, who also responded to the toast, said that a thorough study of Australian conditions on the spot was essential. Single handed efforts would be ineffective; there must be a combined effort to help Australia and fight the foreigner.

The South African Electrical Market.

In the course of a recent review of electrical power development in South Africa, Mr. E. B. Lawson, United States Assistant Trade Commissioner at Johannesburg, says that commercial imports of electrical machinery have been substantial for several years, and have maintained a fairly consistent upward movement, the total values for 1927, the latest available figures, having advanced considerably over those for the several years immediately preceding. The value of electrical machinery, not including certain fittings and materials, imported during 1927 amounted to more than £1,500,000. The United Kingdom controls the major part of the trade, with the United States and Germany furnishing a limited amount of competition. "The strong position of British manufacturers in South Africa is influenced by a number of factors, including the practice of maintaining factory representatives or branch offices in that country, the effect of considerable sums of British capital invested in local enterprises, and the fact that a considerable number of technical advisers and engineers have been trained in English universities."

An American Delegation to Russia.

What is perhaps intended as an offset to the recent visit of English industrial delegates to Russia has just been arranged. It has been decided to send a party of representative American business men to Russia in the summer to study economic, commercial, and industrial conditions there. The visit is being sponsored by the American-Russian Chamber of Commerce of which Mr. Reeve Schley, of the Chase National Bank, is president. The party will muster in Berlin on July 15th and return from there on August 16th.—*Reuter* (New York).

Electrical Imports of Angola.

The latest available figures of the trade of Angola (Portuguese West Africa) are apparently those for 1925. In that year the imports of electrical apparatus amounted to 170 tons, valued at 1,185 contos (£9,300). Great Britain supplied the bulk of this, 155 tons, valued at 650 contos (£5,000). These facts are included in a Department of Overseas Trade report on economic conditions in Angola by Mr. R. J. Smallbones, M.B.E., British Consul-General at Loanda (Stationery Office, 1s. net).

United States Electrical Exports.

The exports of electrical equipment from the United States during March last were valued at $14,337,158, as compared with $9,675,491 in March, 1928, raising the total for the first quarter of the year from $25,548,648 to $35,719,342. The principal increase occurred in the case of refrigerators up to 1-ton capacity—from $417,307 to $1,417,920. Exports of unspecified apparatus increased from $624,940 to $1,351,539. Other notable increases were: Bare copper wire, from $159,610 to $406,646; insulated copper wire, from $432,989 to $692,085; radio apparatus, from $858,302 to $1,486,898; accessories and parts for motors, from $214,585 to $369,911; ignition equipment, from $208,742 to $535,603; and fractional h.p. motors, from $244,878 to $353,498. The decreases were few in number and comparatively unimportant. Canada, as usual, was the principal customer for American electrical equipment, her share amounting to $3,320,621. The United Kingdom ($1,053,144) took second place, and Argentina ($1,010,498) was third. Other leading importers were Japan ($765,995), Brazil ($682,607), Australia ($614,627), Cuba ($502,969), and British India ($471,361). Imports of electrical equipment by the United States were valued at only $230,286, of which Sweden was responsible for $87,453, and Japan for $72,182 (mainly lamps).

New Indian Companies.

Among the electricity supply companies recently formed in India are the Jalgam Electric Supply Co., 47, Apollo Street, Fort, Bombay, capital 500,000 rupees, and the Jalparguri Electric Supply Co., Jalparguri, Bengal, capital 175,000 rupees.

The North-Midland E.D.A. Committee.

Arrangements have been made by the North Midland Area E.D.A., for the third area sales conference to be held at the Corporation Electricity Offices, Sunbridge Road, Bradford, on June 4th. Mr. C. E. Allsopp, A.M.I.E.E. (Bradford Corporation) will speak on the subject of "The Development of the Electric Cooker." The chairman will be Alderman W. Illingworth, Bradford.

Recent Contracts.

A-S REFRIGERATING MACHINES, LTD., one of the associated companies of the General Electric Co., Ltd., has received an order from Messrs. Boots, Cash Chemists, Nottingham, for 14 sectional refrigeration cabinets, each fitted with the hermetically-sealed, leakage and explosion-proof "A-S" automatic refrigerating machine. These cabinets will be installed in the various cafés controlled by Messrs. Boots.

Plymouth Corporation has placed an order for phono-electric trolley wire with the EQUIPMENT & ENGINEERING CO., LTD. This company has also received an order from Bradford Corporation for an electric heater for shrinking on tramcar tires.

Hungarian Electrical Imports.

The value of the electrical machinery and appliances imported into Hungary during last year amounted to approximately £765,030, as compared with £472,390 in 1927.

Bankruptcy Proceedings.

H. PEOVER, Market Lane, Newcastle-upon-Tyne, electrical apparatus and tool merchant.—The first meeting of creditors was held on May 22nd, at the Official Receiver's office, Newcastle. A statement of affairs was submitted showing liabilities of £1,869, against assets of £235. The debtor's stock, which had been valued at £612, had realised only £140. It was reported, in support of the debtor's statement that the stock had been "sacrificed," and that the Official Receiver had in his possession a letter from a business friend of the debtor, who had been prepared to offer £300. The case, being a summary one, remained in the hands of the Official Receiver as trustee of the estate.

E. R. MILLWARD, trading as "West of England Radio," 67, High Street, Barnstaple, Devonshire, wireless engineer.—The first meeting of creditors herein was held on May 14th at the Official Receiver's offices, Exeter. No statement of affairs was lodged as the debtor was too ill to prepare one or to attend the meeting. The matter was left in the hands of the Official Receiver as trustee.

S. E. HUNT, electrical engineer and contractor, 8a, Torwood Street, Torquay.—Receiving order made May 17th, on debtor's own petition.

J. WESTNUTT (J. V. Westnutt), electrical engineer, High Street North, Dunstable.—First and final dividend of 9s. in the £, payable May 31st, at the Official Receiver's offices, The Parade, Northampton.

E. C. JENKINS, wireless dealer, 124, Cheltenham Road, Bristol.—Last day for proofs for dividend, June 4th. Trustee, Mr. H. Ashton, Official Receiver, 26, Baldwin Street, Bristol.

Company Liquidations.

F.E. INDUSTRIALS, LTD., electrical appliance manufacturers, London and Glasgow.—The statutory meeting of creditors was held recently in Glasgow, when Mr. J. M'Connell, the liquidator, reported that the liabilities were £8,628, and the net assets £2,941, leaving a deficiency as regarded the creditors of £5,687. The company was formed rather more than a year ago for the purpose of selling washing machines and vacuum cleaners. It purchased the patent rights of a certain machine, and efforts were made to sell the Continental rights to a German company, but the matter fell through. The company had agreed to pay £2,000 for the Continental patent rights, but only £1,000 had been paid. A sales manager was appointed, but when he submitted his scheme to the directors, there were not sufficient funds to carry it through. Negotiations for the sale of certain rights took place, but they proved abortive, and liquidation took place. The issued capital was £6,500, and the deficiency of £12,187 as regarded the shareholders was accounted for by a number of items, including a loss of £8,187 on trading. A resolution was passed confirming the voluntary liquidation of the company, Mr. T. D. Galbraith, accountant, Glasgow, being appointed to act as joint liquidator.

THERMIT, LTD.—A meeting of creditors was held on May 29th at Imperial Chemical House, Millbank, S.W. Particulars of claims by May 29th to Mr. R. W. Liddell, liquidator, Imperial Chemical House.

IRISH HYDRO-ELECTRIC SYNDICATE, LTD.—A meeting of members is called for June 26th at 18, St. Swithins Lane, E.C., to hear an account of the winding up from the liquidator, Mr. W. Pocock.

ELECTRIC FACTORS (BLACKPOOL), LTD.—Winding up voluntarily. Liquidator, Mr. J. Todd, 18, Birley Street, Blackpool.

Private Arrangements.

G. N. JENKINS, 195a, Earl's Court Road, S.W.5, electrical engineer, &c.—A meeting of creditors was held on May 22nd at the offices of Messrs. Fincham, Partridge & Co., 3, Warwick Court, Gray's Inn, W.C.1, when a statement of affairs was presented showing ranking liabilities of £963 and net assets of £710, leaving a deficiency, subject to costs of realisation, of £253. The debtor commenced trading on his own account about 1918, having been previously employed in a business. He started with a capital of £1,200, and accounts showed that in the first year he made a net profit of £24. In 1920 he sustained a loss of £128, and in 1921 a loss of £228. The following three years he made profits of £37, £185, and £38, respectively. In 1925 he incurred a loss of £222, and in 1926 a loss of £305, the drawings in that year being £534. In 1927 there was a profit of £13, the drawings being £549, and in 1928 there was a profit of £8, and the drawings were £536. It was decided that the estate should be dealt with under a deed of assignment in favour of Mr. A. S. Partridge as trustee, with a committee of inspection.

Dissolution of Partnership.

W. H. TRACE & SON, electrical engineers, 26, Upton Road, Birkenhead.—Mr. W. H. Trace and Mr. H. G. Trace have dissolved partnership. Mr. H. G. Trace will attend to debts and continue the business in conjunction with Mr. W. T. Trace and Mr. G. A. S. Trace.

Social Event.

The association football team of the Sports Club of William Geipel, Ltd., has had a successful season. It was joint winner of the championship of the Harrow and District Football League, and also won the Wembley Hospital Cup. A celebration dinner was held at the Bell Hotel, Ealing, on May 17th, at which the cups and medals were presented to the team by Mr. Kenneth Geipel.

Conditions in Russia.

An interesting description of his recent journey to Russia with the British Trade Delegation was given at Yeovil on May 16th to a large audience by Mr. E. M. Benjamin, secretary of Messrs. Petters, Ltd. The bulk of the address dealt with the life of the people under Soviet rule, but the speaker concluded with a reference to trade possibilities. He said that between 1922 and 1927, the dates when "Arcos" was established in London and when it was raided, the Soviet authorities purchased from us material valued at no less than £204,000,000, which figure included exchange contracts and goods for re-export, such as wool, cotton and white metal. M. Piatakov, President of the Soviet State Bank, was therefore not talking "astronomically" when he spoke of orders between £150,000,000 and £200,000,000 in exchange for political recognition, long trade credit, and a big loan to Moscow. Undoubtedly Russia's needs are enormous. The great stumbling block to trade with Russia is the question of credit. They will not and cannot pay cash. At the present time their vast industrial programmes are proceeding slowly. They are making every effort to build up their own internal industries and make themselves self-supporting in every way. They aim in the course of years to make themselves a second United States. Whilst we stand aside Germany and the United States are supplying them.

Foreign Loans in the United States.

The following were among the foreign capital flotations publicly offered in the United States during the first quarter of 1929: The Copenhagen Telephone Co., $3,575,000; the Berlin City Electric Co., $9,651,000; the Prussian Electric Co., $4,000,000; the Unterelbe Power and Light Co., $600,000; the Utilities Power and Light Corporation (Great Britain),

$5,000,000; the Pirelli Co. (Italy), $3,000,000; the United Electric Service Co. (Italy), $2,350,000; the Intercontinents Power Co. (Argentina), $1,485,000; the International American and Foreign Power Co. (Argentina), $100,827,200; and the following Canadian undertakings: International Power and Paper Co., $10,000,000; the Montreal Tramways Co., $250,000; Bell Telephone Co. of Canada, $7,500,000; International Hydro-Electric System, $13,000,000; Power Corporation of Canada, $2,500,000; and the Shawinigan Water and Power Co., $4,000,000.

Unemployment.

A decrease of 28,005 in the number of unemployed persons on the registers of the Employment Exchanges was shown for the week ended May 13th. At that date the total was 1,104,700, as compared with 1,132,705 on May 6th, and 1,118,390 on May 14th, 1928.

Trade Announcements.

The Devon Radio and Electrical Co. has opened, at 331, Torquay Road, Paignton, a showroom and workshop under the management of Mr. E. White.

The head office of Austinlite, Ltd., has been transferred to the company's Smethwick factory. The address is:—Austinlite, Ltd., c/o Chance Bros. & Co., Ltd., Electrical Department, Lighthouse Works, Smethwick, near Birmingham.

Mitcham Works, Ltd., electrical and radio manufacturers, has acquired works at New Road, Mitcham Junction, from the Mullard Radio Valve Co., Ltd.

Owing to expansion of business, Lighting Trades, Ltd. (which incorporates J. & W. B. Smith, Ltd.), has removed its trade counter to larger premises at 17-19, Farringdon Road, E.C.1, the old address of J. & W. B. Smith, Ltd. The head office and showrooms will remain at 30-31, Farringdon Street, E.C.4.

The Glasgow office of the English Electric Co., Ltd., has been removed to 200, St. Vincent Street.

Messrs. F. W. Cook & Co. (Southampton), Ltd., have opened new electrical showrooms at Russell House, Hanover Buildings, Southampton.

The new London address of Messrs. Wm. McGeoch & Co., Ltd., is 48, Berners Street, W.1. (Telephone: Museum 9423; telegrams: "McGeoch (Wesdo) London."

The name of the Greenwich Cable Works, Ltd., has now been changed to the Croydon Cable Works, Ltd., consequent upon its removal to larger and more up-to-date works in Mitcham Road, Croydon. The new works is equipped with modern machinery for manufacturing paper-insulated lead-covered cables and the "Pernax" cables in connection with which the company was founded in 1902.

Messrs. Hosken, Trevithick, Polkinhorn & Co., Ltd., Truro, have opened new showroom premises in connection with their electrical department.

Messrs. Frank V. Collins & Co., electrical engineers and contractors, Wimbledon, are opening a new branch at 333, High Street, Sutton, Surrey, on June 1st, and ask for fittings catalogues, showcards, &c.

Messrs. Simkin & Co., electrical and mechanical engineers, are opening a new showroom at 58a, Islington, Liverpool, on June 3rd; they ask for catalogues and price lists of electrical fittings, domestic appliances and accessories.

German Foreign Electrical Trade.

The imports of electrical machinery, apparatus and fittings into Germany during the first two months of the current year attained a value of £427,950, as compared with £403,850 in the corresponding period of 1928. There was also a marked increase in the exports of similar material from Germany—from £3,928,900 to £4,602,900.

A Wiremen's Guide.

A linen-mounted folder of convenient size, containing information of use to wiremen has been produced by British Insulated Cables, Ltd. This includes a comparison of the old and new standards for annealed circular copper conductors, and gives such information as current-carrying capacity, resistance, weight, &c.

Electric Lighting Contracts.

In our issue of May 10th we included among recent lighting installation contracts carried out by Messrs. Best & Lloyd, Ltd., the Ritz Palais de Danse, Manchester, and the Manchester Ship Canal offices. The company asks us to state that the work was carried out on behalf, and to the instructions, of the Edison Swan Electric Co., Ltd., Manchester.

New Catalogues and Lists.

Messrs. Mavor & Coulson, Ltd., 47, Broad Street, Mile End, Glasgow.—An illustrated booklet showing d.c. and a.c. switchboards installed at various works.

Wholesale Fittings Co., Ltd., 23, 25, 27 & 37, Commercial Street, E.1.—Catalogue No. E.229, illustrating the company's electrical accessories. Priced.

Messrs. L. Wefkes (Luton), Ltd., Luton, Beds.—A well-produced brochure describing, with illustrations, switchgear and fuses, including a change-over and four-pole switch-fuse contained in one case. A tab bearing the company's name, affixed to the booklet facilitates reference after it has been filed.

Messrs. S. G. Brown, Ltd., Western Avenue, North Acton, W.3.—The "Brown Budget" for May contains interesting articles on new activities at the company's works at Acton, its loud speakers and electro-megaphones.

Accumulators of Woking (1928), Ltd., Maybury Hill, Woking.—A booklet giving a general description of "Woking" stationary batteries, together with instructions for handling and preparing for installation, first charge and working. A price list of house lighting and power station batteries is included.

Messrs. J. J. Eastick & Sons, Eelex House, 118, Bunhill Row, E.C.1.—A comprehensive and well-arranged catalogue of wireless receiving sets and accessories, and gramophones (pp. 243). The sections include valves, complete sets, transformers, condensers, gramophones, gramophone pick-ups, &c. An alphabetical index is provided, and the list is fully illustrated and priced.

Martindale Electric Co., Ltd., The Hyde, Hendon, N.W.9.—A three-page folder describing the company's undercutters, "Commulac" insulating liquid, and commutator stones, illustrated and priced.

Nelson Electric Co., Ltd., Kingston Road, Merton Park, S.W.19.—A price list of the company's electric lamps.

Brookhirst Switchgear, Ltd., Northgate Works, Chester.—Leaflet No. 287, giving particulars of 2- and 3-speed squirrel-cage motor starters.

British Insulated Cables, Ltd., Prescot, Lancs.—Descriptive booklets, illustrated, dealing with "Prescot" seam and spot welders, and a circular drawing attention to the company's armoured cables.

Willmott, Son & Phillips, Ltd., 124-127, Minories, E.1.—A pamphlet describing the "Sbik" lightning arrestor, and a price list of "Fybros" vulcanised fibre rods.

British Thomson-Houston Co., Ltd., Mazda House, Newman Street, Oxford Street, W.C.1.—A card drawing attention to reduced prices for "Mazda" pearl lamps.

American Tariff Alteration.

Recommendations originally included in a report prepared by the Tariff Committee of the National Electrical Manufacturers' Association (United States) have been followed in general in the Bill which was introduced into the Federal Legislature on May 7th. The proposed changes in the electrical clauses of the present tariff law were made with a view to correcting certain inequalities. A new paragraph, designed to provide more adequately for electrical equipment and related articles, reads as follows:—"All articles suitable for producing, rectifying, modifying, controlling, or distributing electrical energy; electrical telegraph, telephone, signalling, radio, welding, ignition, wiring, therapeutic, and X-ray apparatus, instruments and devices, and articles having as an essential feature an electrical element or device, such as electric motors, fans, locomotives, portable tools, furnaces, heaters, ovens, ranges, washing machines, refrigerators and signs; all the foregoing and parts thereof, finished or unfinished, wholly or in chief value of metal and not specifically provided for, 40 per cent. *ad valorem*."

Electricity Meter Approved.

The Electricity Commissioners have approved of the construction and pattern of the "Ferranti" Type F.C.c, single-phase watt-hour meter, rated sizes 10, 12½, 20, 25, 40, and 50 A, 200 to 250 V at 50 cycles per second.

Austrian Lamp Manufacturing.

The Elin Gesellschaft für Elektrische Industrie, Vienna, has recently acquired the controlling interest in the Allgemeine Gluhlampenfabrik Gesellschaft, Floridsdorf, Vienna, and is proceeding with an extension of the works with the object of increasing the output of incandescent lamps.

Local Exhibitions.

Cold Ash.—In conjunction with the inauguration of an electricity supply at Cold Ash, an electrical exhibition was held by the Western Electricity Supply Co., Ltd., recently. At the official opening, Mr. A. J. Bridge, Publicity and Development Manager, gave a short address outlining the uses of electricity in the home and explaining the tariffs for domestic purposes. Cookery demonstrations given by Mrs. Peterson (Credenda Conduits Co., Ltd.), were well attended. The exhibition was very successful resulting in a number of sales.

Otley.—The Electrical Distribution of Yorkshire, Ltd., opened on May 24th an exhibition of electrical appliances—especially domestic—at the Nelson Street Drill Hall, Otley, where demonstrations are being given until June 3rd.

Book Notices.

We have received for review a book entitled "The Economic Effects of Monopoly on British Power Stations," written by Mr. A. H Swain, Chairman of the City of Leicester Electricity Committee. It consists almost entirely of a reprint of the matter which has been published during the past eighteen months after certain British electricity supply authorities had purchased generating plant from abroad. It endeavours to show that members of the B.E.A.M.A. have so grouped themselves that a monopoly is being, or has been, created with regard to the supply of heavy electrical apparatus. The cases which form the background of the book would be better forgotten. In the hasty endeavour to prevent the ingress of

foreign plant, B.E.A.M.A. has undoubtedly made, and has admitted that it has made, mistakes which should now be relegated to the past.

We do not know whether the author wishes to see us return to the conditions of 1913 when cut-throat competition was rapidly reducing the majority of British electrical firms to bankruptcy. He apparently regards the fixing of prices by members of the group as something almost criminal; yet he must know that almost every staple commodity of life is so regulated. Some form of price regulation must, we think persist and if manufacturers will assure themselves that the prices which they quote are reasonable we do not think that the municipality or company which adheres to British plant will have much cause for regret, even though in some instances it may still be possible to purchase more cheaply abroad.

"Kelly's Directory of the Merchants, Manufacturers and Shippers of the World." Two vols. (Pp. 4,648.) London: Kelly's Directories, Ltd. Price 64s., post free.—This is the 43rd edition of this useful directory, which has been revised and brought up to date. In addition to the inclusion of more than a million and a half names covering over 20,000 places, it contains numerous facts and figures of value to the business man. Reference is facilitated by a concise explanation of the arrangement of the various sections.

"Aluminium: its Production and Application," by E. T. Painton. London: British Aluminium Co., Ltd.—This well-illustrated booklet is a reprint of a lecture delivered before the Rugby Engineering Society.

"*Journal* of the American Institute of Electrical Engineers." Vol. XLVIII, May, 1929. No. 5. New York: The Institute. Price $1.

"The A.T.M. Telegraph Engineers' Handbook." First Edition. Pp. 116, illustrated. Liverpool: Automatic Telephone Manufacturing Co., Ltd. Price 2s. 6d.

For Sale.

First Garden City, Ltd., has for disposal one 500-b.h.p. 4-cylinder, 200-r.p.m. Diesel engine, direct coupled to a 437-kVA, 2,000-V, 3-phase, 50-cycle alternator, complete with exciter on combined bedplate. By order of the L.P.S. Electrical Co., Ltd., Messrs. Henry Butcher & Co., will sell by auction on June 18th, the freehold factory in Avenue Road, Acton, W.3. Henry J. Shaw will sell by auction at 13, High Holborn, W.C. on June 4th, wireless apparatus, accumulators, and electrical apparatus. Colne Corporation has for sale one 21.5-h.p. motor-generator, together with motor, generator and charging panels. Fuller, Horsey, Sons & Cassell will sell by auction at the depôt adjoining the main entrance of the Wembley Exhibition grounds, on June 19th, electrical plant and stores removed from the exhibition. (See our advertisement pages to-day.)

The Marking of Imported Glassware.

The hearing of the Application for an Order-in-Council requiring the marking of imported illuminating glassware was resumed by the Board of Trade Committee under the Merchandise Marks Act, 1926, on Monday last.

Mr. R. W. Buckingham, giving evidence against the application, said that 95 per cent. in volume of the decorative lighting glassware used in this country was imported because British makers could not meet the demand. He had been informed that marking would add appreciably to the cost. Moreover, the marking of the glass would convey an impression that the whole fitting was foreign. Difficulty would be experienced where a number of panels of imported glass were used in a fitting. Witness was shown samples of marked glass made by Hailwood & Ackroyd, Ltd., and agreed that the marking was well done; he was surprised that the cost was so small. Mr. Barnes, a member of the Committee pointed out that although the opponents had said that British firms did not make suitable illuminating glassware, their exports were valued at £41,000 last year. Witness replied that the demand of the home market was far greater than £41,000 a year. Mr. J. H. Cresswell (Revo Electric Co., Ltd.) opposed the application on the ground that his company would be greatly handicapped in competing with Continental suppliers of street-lighting fittings if the cost of imported glass was increased by marking. He, too, said that the marking of the glass would brand the whole fitting as foreign. He produced figures showing that the price of British glass was from 72.7 to 189.3 per cent. higher than the foreign prices. With regard to existing stocks he agreed that the exclusion of glassware imported before the date of the Order would avert any trouble in that direction. He also stated that in Government contracts when British goods were stipulated his company employed British glass.

A Russian-American Electrical Agreement.

The announcement is made of an agreement between the Soviet Government and the International General Electric Co., providing for an exchange of patents, as well as an exchange of designing, engineering, and manufacturing information for a term of ten years beginning on July 1st next. American engineers will be sent to Russia to assist the Soviet Electro-technical Trust in carrying out plans for the expansion of the electrical industry in that country. Soviet engineers will likewise go to the United States to study American methods in the manufacture of electrical machinery and equipment.—*Reuter* (New York).

The Timber Market.

Our Timber Trade Correspondent reports that wood consumption is proceeding on brisk lines, the building trade being fairly busy, with a promise of considerable improvement after the turn of May, and onwards throughout the summer. Arrivals of the usual European descriptions have been somewhat heavier, but altogether the season's imports will be about normal, and at a lower range of wholesale prices, compared with recent years. For hardwoods inquiries are by no means excessive, and stocks of prime quality woods are small; prices are very firm, especially for the fancy woods. Sawn hardwoods from the States are still in fairly good supply, but the tendency is towards more moderate shipments this year owing to shippers' firm rates. Plywood is increasing in imports and consumption. It is remarkable how this "featherweight" wood has found its way into many large and small industries.

Aluminium and Copper Prices.

Speaking at the recent general meeting of the Compagnie Générale d'Electricité, M. P. Azaria said that at the same time as the American cartel was imposing on the foreigner an unjustifiable increase of 80 per cent. in the price of copper, the association of European producers of aluminium was maintaining its price steady, and thereby placed the price of aluminium at a level of about half that of copper when measured by equal electrical capacity.

Prices of Materials.

The following prices are only general, and they may vary according to quantities and other circumstances:—

	CHEMICALS, &c.	Price May 28th.	Fortnight's inc or dec.
a	Acid, Oxalic ... ... per lb.	5½d.	...
a	Ammoniac, Sal ... ... per ton	£60	...
a	Ammonia, Muriate (large crystal) ,,	£52	...
a	Bisulphide of Carbon ... ... ,,	...	...
a	Borax ... ... ,,	£25	...
a	Copper Sulphate ... ... ,,	£25 10s.	...
a	Potash, Chlorate ... ... per lb.	3½d. to 4d.	...
a	,, Perchlorate ... ... ,,	5½d.	...
a	Shellac ... ... per cwt.	£18 10s.	...
a	Sulphur, Commercial ... ... ,,	£11	...
a	,, Roll ... ... ,,	£11	...
a	Soda, Chlorate ... ... per lb.	3d.	...
a	,, Crystals ... ... per ton	£5 to £5 5s.	...
a	Sodium Bichromate, casks ... per lb.	3¾d.	½d. inc.
	METALS, &c.		
b	Aluminium, Ingots ... ... per ton	£95 to £100	...
b	,, Wire ... ... per lb.	1/1 to 1/9	...
b	,, Sheet ... ... ,,	1/1 to 2/9	...
p	Babbitts Metal and Anti-friction Metals—		
	Grade I ... ... per ton net	£180	£3 dec.
	Grade II ... ... ,, ,,	£127	£1 dec.
	Grade III ... ... ,, ,,	£71	...
c	Brass (rolled metal 2" to 12" basis) per lb.	10½d.	...
c	,, Tubes (solid drawn) ... ,,	1/1 to 1/1½	...
c	,, Wire, basis ... ... ,,	11½d.	...
c	Copper Tubes (solid drawn) ... ,,	1/3½	...
c	,, Bars (best selected) ... per ton	£112	...
c	,, Sheet ... ... ,,	£112	...
c	,, Rod ... ... ,,	£112	...
d	,, (Electrolytic) Bars ... ,,	£84 10s.	10s. inc.
d	,, ,, Sheets ... ,,	£143 10s.	...
d	,, ,, Wire Rods ... ,,	£94 10s.	10s. inc.
d	,, ,, H.C. Wire per lb.	11½d.	...
f	Ebonite Rod ... ... ,,	2/3 to 2/6	...
f	,, Sheet ... ... ,,	2/3 to 2/6	...
n	German Silver Wire ... ... ,,	2/3	...
h	Gutta-percha, fine ... ... ,,	nom.	...
h	India-rubber, Para fine ... ... ,,	11½d.	½d. dec.
l	Iron, Pig (Cleveland No. 3.) ... per ton	68/6	...
l	,, Wire, galv. No. 8. P.O. qual. ,,	£21	...
g	Lead, English pig ... ... ,,	£25	5s. dec.
g	Mercury ... ... per bot.	£22 2s 6d. to £22 5s.	...
e	Mica (in original cases) small ... per lb.	3d. to 3/-	...
e	,, ,, medium ,,	4/- to 8/-	...
e	,, ,, large ... ,,	10/- to 20/- & up	...
p	Phosphor Bronze, plane castings ,,	1/3½	...
p	,, ,, drawn bars & rods ,,	1/5	...
p	,, ,, rolled strip & sheet ,,	1/8½	...
p	,, ,, wire... ... ... ,,	1/6½	...
o	Platinum ... ... per oz.	£13 17s. 6d.	...
d	Silicium Bronze Wire ... ... per lb.	1/3	...
r	Steel, Magnet, in bars ... ... ,,	7½d.	...
n	Tin, Block (English) ... ... per ton	£197 to £197 10s.	£2 5s. dec.
n	,, Wire, Nos. 1 to 16 ... ... per lb.	3/8	3d. dec.

*For 1 cwt. lots. Special quotations against definite specifications.

Quotations supplied by

a G. Boor & Co.
b The British Aluminium Co., Ltd.
c Thos. Bolton & Sons, Ltd.
d Frederick Smith & Co.
e F. Wiggins & Sons.
f India-Rubber, Gutta-Percha and Telegraph Works Co., Ltd.
g James & Shakespeare.
h Edward Till & Co.
i Bolling & Lowe.
l Richard Johnson & Nephew, Ltd.
n P. Ormiston & Sons.
o Johnson, Matthey & Co., Ltd.
p C. Clifford & Son, Ltd.
W. F. Dennis & Co.

In their letter dated May 25th, Messrs. James Forster and Co. stated that very quiet conditions prevailed in the lead market last week and, with only a small demand from consumers, prices sagged daily and closed at the lowest. The general position is unchanged, consumers' demand continues to be very slack both in this country and on the Continent, while supplies are arriving in a steady stream. This state of affairs seems likely to continue until the General Election is out of the way and the reparations problems solved, when a revival in demand should be seen.

Lighting and Power Notes.

Australia.—CANBERRA.—According to the *Industrial Australian and Mining Standard*, an agreement between the Commonwealth and New South Wales Governments, providing for the supply of electricity from the Burrinjuck hydro-electricity works to the Federal Capital Territory, has been ratified by the New South Wales Parliament. By the terms of the agreement the Federal Capital Commission has undertaken to utilise power from Burrinjuck for a period of ten years, with the option of renewal by the Commission for a further ten years. The arrangement may, however, be terminated by either party after 12 months' notice. Power may not be purchased by the Commission from any other source during the period of the agreement, although the Commission is still permitted to generate electricity at its existing plant. The transmission line will extend over 80 miles of country between Burrinjuck dam and the power house at Canberra. In preparation for the service, the switching apparatus is at present under construction, and the two transformers of 3,250 kVA each for reducing the pressure for local distribution are expected to be in readiness on August 1st next. The main transmission lines will operate at 66,000 V, which will be reduced to 5,500 V for distribution in Canberra, while the voltage for the line to the Cotter pumping station will be raised to 11,000 V. The switchgear used will be manufactured in Australia, the transformers of British manufacture, and the 66,000-V insulators of American make By the agreement, the supply of electricity from the Burrinjuck works will commence on September 1st, 1929.

Braunton (Devon).—SPECIAL ORDER.—The Minister of Transport has confirmed the Special Order made by the Electricity Commissioners authorising the Braunton Electric Light and Power Co., Ltd., to supply electricity in the parishes of Braunton and Heanton Punchardon, in the rural district of Barnstaple.

Brighton.—CHANGE-OVER.—The Corporation Lighting Committee is seeking sanction to the alteration of the system and pressure of the electricity supply to properties in the streets at Patcham from 460/230 V d.c. to 400/230 V a.c., 50 cycles.

LOAN SANCTIONED.—The Corporation Electricity Committee has obtained sanction to a loan of £17,590 for works in connection with the enlargement of the North Road sub-station.

Bury (Lancs.).—LOANS SANCTIONED.—The Town Council has received sanction to loans of £20,000 for mains, and £10,000 for sub-station equipment.

Canada.—ELECTRICAL DEVELOPMENT.—The Manitoba Legislature, by a large majority, has adopted a resolution recommending the Dominion Government to grant priority rights for the development of the White Mud Falls as a power site to the British Dominions Power Syndicate, of London, England. This renders it almost a certainty that the company will obtain the concession, as the Dominion Government, in accordance with the recent resolution of Parliament, is arranging to hand over the water resources of Western Canada to the Provincial Government. The White Mud Falls are situated on the Nelson River about 400 miles north of Winnipeg, and are estimated to be capable of developing 300,000 h.p.

The Provincial Hydro-Electric Power Commission plans to extend its rural service considerably during the present year to meet the demands of the farmers in many sections who are anxious to obtain power. It is proposed to construct, in addition to the 4,000 miles already in operation, more than 1,000 miles of primary lines serving over 6,000 new consumers, and costing approximately $2,500,000.

ONTARIO.—The annual report of the Hydro-Electric Power Commission of Ontario shows a net surplus for the year 1928 amounting to $2,016,000 from its provincially-operated system, which serves 225 municipalities. This surplus is an increase of 58 per cent. as compared with 1927.—*Reuter* (Toronto).

Cartmel.—ELECTRICITY SUPPLY.—A public meeting was held recently to explain to residents details of the proposed electricity supply to the district by Barrow-in-Furness Corporation. Mr. Burnett, electrical engineer to Barrow Corporation, explained the scheme, and said the charge for lighting would be 8d. per kWh (9d. by prepayment meter). Mr. Smith, of the Barrow Electricity Department, said the cost of house wiring would be from 20s. to 25s. per point.

Chester.—YEAR'S WORKING.—The report of the city electrical engineer (Mr. S. E. Britton) on the working of the electricity undertaking for the year ended March 31st last shows a total revenue of £85,062, and working expenditure of £43,424, leaving a gross profit of £41,638. The figures for the preceding year were:—Income, £83,276; working expenses, £42,389; gross profit, £40,887. After providing for capital charges, there was a net surplus of £16,120, as compared with £15,726 in the previous year. The capital expenditure during the year was £41,417, including £32,660 spent on mains. The total sum now spent on the undertaking amounts to £509,096. During the year 1,021 additional consumers were connected (488 in Chester and 533 in the rural area), an increase of 221 on the record established in the previous year. It has been recommended that the following reductions in the charges for electricity be made within the city:—Lighting: From 4½d. to 4d. per kWh. Late shop-window lighting: 50 per cent. of the lighting rate. Domestic rate: The standing charge of 12½ per cent. of the rateable value of the premises reduced to 10 per cent., with a charge of ¾d. per kWh instead of 0.7d. Factories: "Unit" charge from 0.7d. to 0.6d. Factories off-peak demand: "Unit" charge from 0.75d. to 0.6d. Similar reductions have been proposed for the rural area.

Chesterfield.—YEAR'S WORKING.—We have received from Mr. D. H. Davies, borough electrical engineer, a copy of his report, together with the statement of accounts for the year ended March 31st last. The total revenue amounted to £71,295, as compared with £66,276 in the preceding year. Working expenses, &c., totalled £61,780, as compared with £54,504, and there was a net surplus of £9,514, as against £11,772 in 1927-28. The sales of electrical energy rose from 10,700,751 kWh to 11,485,130 kWh, an increase of 7.3 per cent., and the maximum load carried was 5,857 kW, an increase of 9 per cent. The capacity of the plant was increased from 8,025 kW to 14,025 kW by the installation of new 33,000-V bulk supply plant. The operating cost shows a slight decrease from 0.67d. to 0.66d. per kWh. The total number of consumers now connected is 8,618. New installations to the number of 1,306 were connected under the hired-wiring scheme, bringing the total number of hired-wiring consumers connected to 3,949. Capital charges increased during the year by £3,475, due to extensions of mains, 33 miles of which were laid during the year. The average price received for whole supply was 1.35d. per kWh, as compared with 1.36d. for the previous year.

Congleton.—ELECTRICITY SCHEME.—In anticipation of the Electricity Commissioners granting an Order, Mr. A. Ellis, consulting electrical engineer, has been authorised to prepare specifications and estimates for a proposed electricity scheme. The main from which the supply will be taken will form part of the main transmission line to be established from Stoke-on-Trent to Leek, and thence to Congleton.

Continental.—SWEDEN.—According to a Government return issued recently, the output of electricity from the State power stations reached a total last year of 1,561 million kWh, as compared with 1,519 million kWh in 1927, an increase of nearly 3 per cent.

SWITZERLAND.—Construction work will shortly be commenced in preparation for the erection of a power station near Champsec. It is proposed to form an artificial lake containing about 150,000,000 cu. ft. of water by the building of a dam across the higher part of the Val des Dix, to the south of Sion. The water from the lake, together with that supplied from the Liscence torrent, after being led through pipes to the valley of the Rhone, will fall 5,300 ft. to drive the turbines. The power station, which is expected to cost nearly £2,400,000, will take three years to construct and, when completed, will have a capacity of approximately 120,000 kW.

SICILY.—A scheme to utilise the water from the Southern Imera River for hydro-electric development, prepared by the engineer of public works of the Province of Palermo, comprises the construction of the second largest artificial lake in Italy and the erection of a hydro-electric plant capable of the production of approximately 200,000,000 kWh per annum. The enterprise, which has received official approval, will be undertaken by the European Hydro-Electric Co., of London.

Dronfield.—BULK SUPPLY.—The Urban District Council has decided to ascertain if the Sheffield Corporation will provide a supply of electricity in bulk. The Staveley Coal and Iron Co. recently offered a supply, but later withdrew the offer.

Ealing.—SHOP LIGHTING.—The High Street (Ealing) Traders' Association has asked the Electricity Supply Committee for a quotation for the supply and installation of electric lanterns, fitted with 1,000-W lamps, outside the business premises in the High Street, including the maintenance and supply of electricity for 1,000 hours per lantern per annum.

Irish Free State.—ELECTRICITY SUPPLY BOARD.—The *Irish Independent* recently published a report of an interview with Dr. T. A. MacLaughlin, the managing director of the Irish Free State Electricity Supply Board, on the subject of unauthorised undertakings. Dr. MacLaughlin said that under the Electricity (Supply) Act, 1927, the Board was empowered to acquire authorised supply undertakings compulsorily, the compensation payable being the value of the undertakings as going concerns. The Board has made valuations of 64 private undertakings which it desires to incorporate in the national system, and has offered to purchase them on the same basis as it is acquiring the authorised undertakings. Some of the owners maintain that the offers are not reasonable, but the Board considers that they have put an excessive value on their properties.

KILKENNY.—The electricity supply was recently formally switched on by the Mayor. This is the first town in the Free State to benefit by the Shannon scheme, but the supply is at present being obtained from the Pigeon House, Dublin, pending the completion of the general scheme.

London.—ST. MARYLEBONE.—The Finance Committee has reported that the Electricity Commissioners have granted sanction to a loan of £25,000, on account of the £33,000 required for the provision of three sets of 3,000-kW rectifiers and convertors. Sanction has also been given to a loan of £5,800 for the provision of two additional cables to be laid to Blandford Street sub-station in connection with the bulk supplies of electricity from the Central Electric Supply Co., Ltd.

BATTERSEA.—The Borough Council Electricity Committee has considered reports of the electrical engineer with reference to the increasing demand for electricity in certain parts of the borough, and the necessity for laying additional mains and installing further sub-station plant, and has set aside £20,000 for this purpose. The Committee has also decided to improve the lighting in The Avenue, Clapham Common, and Nightingale Walk, at a cost of £1,116.

The Borough Council is seeking sanction to the following loans:—Additional plant for Lavender Hill and Chatham Road sub-stations, &c., £10,208; changing-over from d.c. to a.c. in Albert Bridge Road and Prince of Wales Road, £12,665.

FULHAM.—The Borough Council has approved the following expenditure:—Sub-stations and equipment, Nursery Garden, Bishop's Park, £2,934; Harwood Road school, £2,214; and premises of Messrs. Peugeot (England), Ltd., £1,885. Messrs. Joseph C. Mount & Co. have also agreed to the erection of a sub-station at their works, the firm to bear the costs of erection and also to pay £250 to the Council for the provision of equipment. Mains extensions are to be carried out by the Lighting and Electricity Committee at a cost of £1,480.

Macclesfield.—REDUCED CHARGE.—The Board of Guardians has accepted the offer of the Macclesfield Electricity Co. to supply electricity to the Poor Law institution at the reduced charge of £5 per kW and 1½d. per kWh up to 5,000 kWh per quarter, with a further reduction beyond.

Northern Ireland.—BANGOR.—A proposal has been made to take a bulk supply of electricity from the Corporation of Belfast. According to the proposed scheme, electricity will be delivered at Bingham Street, the centre of the area, at 22,000 V, and there transformed down to 6,000 V, at which pressure the Corporation will receive it and transform it to the consumers' pressure. The Corporation has announced its intention of lighting the sea front, which extends over a distance of three miles.

Nuneaton.—YEAR'S WORKING.—At a recent meeting of the Town Council, the Electricity Committee presented a report on the working of the electricity undertaking for the year ended March 31st last, which showed a net profit of £2,234. A return was also presented showing the costs of all municipal electricity undertakings having outputs under six million kWh, and in this list Nuneaton took sixth place.

Price Reductions.—Reductions in the charges for electricity have been made or recommended in the following districts:—

LONDON.—*St. James' and Pall Mall Electric Light Co., Ltd.*—Lighting: From 4d. per kWh for first 4,000 kWh to 4d. per kWh for first 2,000 kWh of annual consumption. For all energy in excess of 2,000 kWh 3d. per kWh. The minimum charge is 10s. per quarter. The reduction will operate as from Christmas, 1928.

Welshpool.—NEW CABLES.—The North Wales Power Co. has decided to extend its h.p. cable from Oswestry to Welshpool at an early date.

Wing.—ELECTRICITY SUPPLY.—The Rural District Council has decided to ask the Aylesbury Town Council if a supply of electricity can be given to the parishes of Ivinghoe, Pitstone, Marsworth, and Cheddington. In 1924 Luton Town Council was granted an Order to supply electricity in the Wing rural area and, as the supply has not been given within the stipulated time, the application mentioned above has been made. The Council has also decided to ask the Luton Corporation if it will be possible to supply electricity to the parishes of Soulbury and Wing.

Tramway and Railway Notes.

Burton-on-Trent.—PROPOSED TRAMWAY ABANDONMENT.—At the last meeting of the Town Council, the Tramways Committee stated that it was seriously considering the question of abandoning the tramway and extending the 'bus service.

Continental.—SPAIN.—The Sociedad de Tramways de Sevilla has recently secured a concession for the construction of an electric railway between Gelves and Puebla del Rio, in the province of Seville.

Coventry.—TRAMWAY EXTENSION.—The Corporation Transport Committee has recommended a short extension of the Binley Road tramway.

Croydon.—LOAN SANCTIONED.—The Corporation Tramways Committee has obtained sanction to a loan of £4,000 for reconditioning and providing tops for nine bogie cars.

Glasgow.—PINKSTON STATION.—It is announced that the Electricity Commissioners have refused permission to the Corporation to proceed with its scheme for the extension of the power station at Pinkston in connection with the Tramway Department. It was proposed to expend £237,000. Regarding the future a section of the Corporation, it is reported, thinks that Pinkston will continue as a separate station only during the life of the present plant, and that eventually the energy required for the tramway will be taken from Dalmarnock power station. On the other hand, some of the members hold that, as the Corporation has already given authority, a commencement will now be made with reconditioning the Pinkston plant at a cost of approximately £160,000. The whole position is to be reviewed by the Tramways Committee which will make recommendations to the Corporation.

Greenock.—TRAMWAY ABANDONMENT.—An agreement has been concluded by the Corporation and the Greenock Motor Services Co. for the abandonment of the tramcar service at an early date. The Corporation has accepted the offer of 2s. 6d. per sq. yd. for the removal of the tramway track, and is to receive for disposal the rails, cables, &c. In addition, the 'bus company is to pay the Corporation £2,000 in settlement of all claims against it. The question of increasing the 'bus fares has been delayed for three months, and the Corporation has decided not to place any obstacle in the way of the withdrawal of the trams at an earlier date than originally intended.

Japan.—RAILWAY ELECTRIFICATION PROGRESS.—A report issued recently by the Japanese Government Department of Railways for the year ended March 31st, 1927, states that the Department at that date was operating 8 power stations and 37 transformer sub-stations. Altogether there were 14 prime movers, representing 30,992 h.p., 201 dynamos and convertors, totalling 108,114 kW, and 186 transformers, representing 116,754 kVA. The length of transmission lines totalled about 3,300 miles. The number of electric motors for car propulsion numbered 1,404, representing 127,800 kW, while the number of motors for operating electric locomotives was 318, with an aggregate capacity of 69,196 kW. An announcement made early last year gave the cost of new electrification plans at about £2,000,000 spread over a period of four years. Since then, states the *Far Eastern Review*, the Department has announced a programme for the electrification of nine sections of five trunk lines at a cost of £4,000,000, spread over a period of six years. The new plan, to be brought into effect next year, is to electrify all the sections of the railways throughout the country that include tunnels or heavy gradients. The scheme also includes the construction of a new elevated electric line about 1¼ miles in length, to connect the present Ochanomizu station of the Yamamote line, which is the inner loop of the line encircling Tokio, with the Ryogoku railway station, the terminus of the Boso and Hojo lines, and of laying parallel tracks between Ryogoku and Kameido.

London.—BREAKDOWNS.—The failure of cables on the westbound track at Bond Street station, Central London Railway, on May 21st, caused a delay from 3.50 to 4.27 p.m. Smoke filled the station, and it was thought advisable to close the station for the above-mentioned period. Trains reversed at Oxford Circus and Marble Arch stations. As a result of the fusing nearly all the lights on the trains and platforms were extinguished and the escalators stopped. By the time the fire brigade arrived the flames had been already got under control. No one was injured, and passengers were able to leave by way of the escalators. A delay of from eight to twelve minutes' duration also occurred about 3.30 p.m. on most of the Under ground railways owing to a defect at Euston sub-station.

Reading.—YEAR'S WORKING.—The profit on the operation of the Corporation tramways and motor omnibuses during the past year amounted to £2,464, as compared with £7,182 for the preceding year. The decrease is attributed to the petrol tax and to the increased price of petrol.

Telegraph and Telephone Notes.

International Telephony.—GREECE.—An Italian proposal is under consideration for the establishment of direct telephone communication between Rome and Athens, the cost of installing the cable to be shared, says the *Financial News*. Telephone communication with Belgrade is also being examined in Athens.

Irish Free State.—AUTOMATIC TELEPHONY.—The whole of the Dublin telephone system is to be converted to automatic working towards the middle of next year. The Minister for Posts and Telegraphs, who on many occasions has shown the great importance he attaches to a highly-developed telephone system as an aid to the prosperity of the Irish Free State, has now decided upon this change, for reasons unusual in a Government service. At his suggestion, a vote of automatic subscribers was taken with a view to gauging opinion. No less than 65 per cent. replied to the Post Office interrogatory, and of them 95 per cent. were in favour of automatic working.

Radio-telephony.—BERLIN—SYDNEY.—After the wireless telephone conversations between Berlin and Bangkok last month experiments were begun between Germany and Australia, and on May 23rd communication was tested with, it is claimed, success between a house in Berlin and a house in Sydney—a distance of over 11,000 miles—by short-waves from Nauen.

Switzerland.—LEAGUE RADIO STATION.—The Secretariat of the League has announced that in reply to a request for information concerning the cost of building a League wireless station made to various companies with a view to obtaining

the supplementary data asked for by the last Assembly, the Secretary-General of the Transit Committee has received a joint proposal from the Compagnie Générale de Telegraphie Sans Fil in Paris and the Telefunken Company of Berlin. The proposal is accompanied by a detailed description of a radio-telegraph and radio-telephone station for the League of Nations, and provides for close technical co-operation between the German and French wireless industries. The companies consider that in view of the international character of the League services such co-operation would be useful, says *The Times*. The wireless telegraph station at Nyon, on Lake Geneva, which will probably be in service by the time of the League Assembly in December, is being constructed for Radio Suisse by the Marconi Company of London. The Swiss Government has already offered to place this station at the disposal of the League in times of emergency.

Switzerland.—TELEPHONY.—The 1929 Budget of the Swiss Telephone and Telegraph Department includes a sum of £466,620 to be expended on new equipment.

The Telephone Service.—MANX CABLE.—The last section of the 130 miles of cable built by Messrs. Siemens Bros. & Co., Ltd., at Woolwich for telephone communication between the Isle of Man and England and Ireland was coiled on board the cable ship *Faraday* during the night of May 24th. By the middle of July it should be possible for the first time for London to talk to Manx towns.

Radio Notes.

Holland.—THE PRAGUE PLAN.—It is understood that the popular Hilversum broadcasting station is provisionally retaining its present wave length of 1,070 metres, as Norway, which was allotted this wave-length by the recent official Prague Conference, does not require it for the present. The decision of the Prague Conference to allot Holland only two wavelengths from June 30th, namely, 1,875 metres and 298 metres, thereby necessitating a change in Hilversum's wave-length, caused an outcry throughout Holland and a monster petition, bearing nearly half a million signatures, was presented to the Ministry of Public Works.—*Reuter's* (Amsterdam).

Irish Free State.—FINANCE.—The estimate for wireless broadcasting is £26,510 for the current year, but other expenditure in connection with the service brings the total up to £31,385, says the *Irish Independent*. The receipts from licence fees and advertisements are estimated at £15,040. Last year the receipts from licences amounted to £13,382, while the import tax on sets realised £27,500. Deducting the cost of collection, there was on the year's working a surplus of £9,258, reduced to £6,658 after capital charges had been defrayed. The Parliamentary Secretary to the Minister for Finance has informed the Dail that 26,000 licences were issued during the year. Licencees in Britain represent more than 6 per cent. of the population; licencees in the Irish Free State are well below 1 per cent.

Madeira.—FUNCHAL STATION.—A short-wave transmitter has been erected at Funchal, on the island of Madeira, of a power of 0.3 kW. The inaugural broadcast will take place on June 1st. The station is working on a wavelength of 47 metres, and its call sign is CT3AG.

Railway Radio. — CONTINENTAL INSTALLATIONS. — "Radio-Fer" Société pour la Radiophonie dans les Gares et Sur les Reseaux de Chemins de Fer is the name of a new company which has lately been formed in Paris, with a capital of 100,000 fr., to install radio receivers at the railways stations and on passenger trains in France. The new concern is working in conjunction with the Hungarian company which is responsible for similar installations on the trains running in Hungary. In Rumania and Germany similar installations are being carried out.

Sweden.—NEW STATION.—A big new broadcasting station for Stockholm is to be erected at Spaanga, near Stockholm. The designs for masts, 150 metres high, have been approved and tenders for their construction are invited by Kungl. Telegrafstyrelsen before June 1st. A beacon to assist aviators will possibly be fitted at the top of one of the masts.—*Reuter's Trade Service* (Stockholm).

Contract Information.

When "Contracts Open" are advertised in our "Official Notice" pages, the date of the ELECTRICAL REVIEW containing the advertisement is given in parentheses below.

Contracts Open.

Australia.—MELBOURNE.—July 15th. State Electricity Commission of Victoria. Two 750-kVA transformers and spares. (B.X. 5325.)*

July 23rd. Posts and Telegraphs Department. Telegraph instruments. (B.X. 5323.)*

Belfast.—June 17th. Electricity Department. Manufacture, supply and delivery of h.p. combined cubicle and truck type switchgear and transformer kiosks, and the manufacture, supply, delivery and erection of one 1,000-kW rotary convertor, one 500-kW rotary convertor, c.c. switchgear, h.p. armourclad switchgear, and h.p. truck-type switchgear for sub-stations. (See this issue.)

Colwyn Bay.—June 14th. Electricity Department. Supply, laying and jointing of e.h.p. and l.p. cables. (See this issue.)

Croydon.—June 3rd. Electricity Department. Supply, delivery, and erection of one 20/25,000-kW turbo-alternator, with auxiliaries, boiler-house extensions with two 160,000-lb. boilers, coal-handling plant, &c., engine room extensions, switchhouse, bridges, and pump house, and 6,600-V switchgear, transformers, &c. (May 10th.)

Dundee.—June 5th. Town Council. Electrical installation at housing scheme. Particulars from Mr. G. Baxter, director of housing.

East Grinstead.—June 17th. Electricity Department. Supply, laying and jointing of a system of l.p. cables, complete and ready for use. (See this issue).

East Ham.—June 12th. Education Committee. Installation of electric lighting at Salisbury School. Specification 10s., from Mr. F. H. Thompson, secretary, Town Hall, East Ham.

Egypt.—CAIRO. August 13th. Ministry of the Interior. Supply of an electric power station with underground and overhead network for the town of Maghagha. (B.X. 5318.)*

Farnworth.—June 15th. Electricity Department. Supply of l.p. cables. (See this issue.)

Halifax.—June 7th. Health Committee. Electrician's work required in erection of pavilion and extension of administrative block, Shelf Sanatorium. Form of tender from Borough Engineer. Deposit £1 1s.

London.—CENTRAL ELECTRICITY BOARD.—June 17th. Supply, delivery and erection of 33-kV and lower voltage switchgear for the North-West England and North Wales Electricity Scheme, 1928. (May 17th.)

ST. PANCRAS.—June 6th. Electricity Department. Supply of one 1,000-kW motor convertor. (May 17th.)

COMMISSIONERS OF H.M. WORKS.—June 3rd. Supply of fuseboards and switches. (May 24th.)

METROPOLITAN ASYLUMS BOARD.—June 12th. Installation of two electric passenger lifts at Colindale Hospital, fire-alarm system at High Wood Hospital, and electric bell system at Wandsworth casual ward. (May 24th.)

CENTRAL LONDON SCHOOL DISTRICT. June 8th. Four motors, switchgear equipment, steel shafting, leather belting, &c. (May 24th.)

New Zealand.—WELLINGTON.—June 16th. Posts and Telegraph Department. Telephone bells. (B.X. 5272.)*

August 7th. Enamelled and silk-covered resistance wire. (B.X. 5322.)

August 13th. Public Works Department. Water turbine-driven generating sets and switchgear for Waitaki. (B.X. 5278.)*

September 4th. Government Railways. Motor generator. (B.X. 5308.)*

AUCKLAND.—August 19th. Auckland Electric Power Board. Single-phase transformers. (B.X. 5324.)*

Sheffield.—June 7th. Sheffield Education Committee. Installation of electric wiring and fittings at eight Council schools. Mr. W. G. Davies, city architect, Town Hall, Sheffield (deposit £1).

South Africa.—PRETORIA.—June 27th. Posts and Telegraphs Department. Automatic wall and table-pattern telephones. (B.X. 5273.)*

PIETERSBURG, TRANSVAAL.—August 13th. Municipal Council. Steam-raising plant, engine alternators, and switchgear. (A.X. 7983.)*

August 13th. H. and l.p. cable, lamps and sundries. (B.X. 5312.)*

Stockton-on-Tees.—June 11th. Electricity Department. Supply and delivery of two 1,250-kVA 3-phase transformers and l.p. 3-phase switchgear. (May 24th.)

Uruguay.—PORT AUTHORITIES.—July 22nd. 300-kilo electro-pneumatic drop-hammer. (A.X. 7974.)*

Walthamstow. — June 12th. Electricity Department. Supply, delivery and erection of two cooling towers and one ferro-concrete tank. (May 24th.)

West Ham.—June 17th. Education Committee. Installation of electric lighting at Fyfield open-air school extension, and installation of water-heating apparatus at Balaam Street School, Plaistow. (May 24th.)

*Further particulars can be obtained at the Department of Overseas Trade (Inquiry Room), 35, Old Queen Street, S.W.1.

Contracts Closed.

Bolton.—Tramways Committee. Accepted :—
Vehicle-washing plant.—Equipment & Engineering Co., Ltd.

Brighton.—Lighting Committee. Accepted :—
Erection high-pressure switch rooms, with cable basements, &c., at North Road works (£15,081).—J. Crewdson (Horley)
De-aerating plant (£976).—Vickers-Armstrong, Ltd.
Works in connection with reconstruction of boiler-house roof, bunkers, &c., at Southwick power station (£4,234).—Heenan & Froude, Ltd.

Chertsey.—Board of Guardians. Accepted :—
Installing electric light at the Institution (£525).—Woking Electric Supply Co., Ltd. Thirty-six tenders were received, the highest amounting to £1,600.

Devizes.—The Rural Council has received the following tenders for installing electric light at 42 houses :—

EDWARDS & ARMSTRONG, LTD. (Accepted.)	£213
A. R. Fox	197
Tower Electrical Supply Stores	203
H. Rossiter & Co.	215
James Bros.	219
W. Drysdale	227
Harden & Chinnery	232
Ramsay & Sons	233
D. Henderson	240
T. Humphries	261
Cross Bros.	261
H. H. Burrows	277
J. W. E. Simpson	294
Webb & Rogers	300
V. H. Dipple	320
F. Wadman	420
Marsh & Yeomans	480

Dumfries.—CORRECTION.—The Town Council, on the recommendation of the Electricity Committee and electrical engineer, at a recent meeting, unanimously agreed to accept the tender of the British Thomson-Houston Co., Ltd., for turbo-alternator plant, and not that of the Brush Electrical Engineering Co., Ltd., as stated in our issue of May 24th.

Durham.—County Education Committee. Accepted :—
Electrical installations at various schools : Jarrow Secondary School (£222), Law & Burns; Tudworth New Council School (£102), and New Seaham Council School (£262), F. Reid Ferens & Co.; Ryton New Council School (£220), Robson & Coleman.

Essex.—County Council.
Laying underground electric mains at sanatorium, Harold Court (£510).—Christy Bros., Ltd.

Government Contracts.—The following Government contracts were placed during April, 1929 :—

ADMIRALTY, CONTRACT AND PURCHASE DEPARTMENT.
Motor alternators.—Mackie & Co., Ltd.; Haslam & Newton, Ltd.
Batteries.—Ever Ready Co. (Great Britain), Ltd.
Supply boards.—Whipp & Bourne, Ltd.
Ring main breakers and pushers.—Whipp & Bourne, Ltd.
Electric cable.—Connollys (Blackley), Ltd.; Hackbridge Cable Co., Ltd.; India Rubber, Gutta Percha & Telegraph Works Co., Ltd.; Siemens Bros. & Co., Ltd.
Condensers.—Dubilier Condenser Co. (1925), Ltd.; Telegraph Condenser Co., Ltd.
Electric crane.—Wharton Crane & Hoist Co., Ltd.
Portable electric fan units.—Electro Dynamic Construction Co., Ltd.
Electric fuses.—Pinnacle Switchgear & Fuse Co.
Motor generators.—Haslam & Newton, Ltd.
Insulator fittings, boards, &c.—Micanite & Insulators Co., Ltd.
Magnetic keys.—Park Royal Engineering Co., Ltd.; H. W. Sullivan, Ltd.
Telephone leads.—London Electric Wire Co. & Smiths, Ltd.
Electric lift.—W. Wadsworth & Sons, Ltd.
Main and auxiliary propelling motors.—General Electric Co., Ltd.; Metropolitan-Vickers Electrical Co., Ltd.
Switch-fuse panels, &c.—Whipp & Bourne, Ltd.
Turbine blading material.—J. Wilkes, Son & Mapplebeck, Ltd.
W.t. valves.—Mullard Radio Valve Co., Ltd.

WAR OFFICE.
Electric cable.—Enfield Cable Works, Ltd.; India Rubber, Gutta Percha & Telegraph Works Co., Ltd.
Leclanché cells, blocks, &c.—Siemens Bros. & Co., Ltd.
Copper rings.—T. Bolton & Sons, Ltd.
W.t. valves.—General Electric Co., Ltd.
Wireless telegraph sets.—Plessey Co., Ltd.

AIR MINISTRY.
Milliammeters.—Everett, Edgcumbe & Co., Ltd.
Valves.—Edison Swan Electric Co., Ltd.
Voltage control boxes.—Johnson & Phillips, Ltd.
Aluminium sheets.—British Aluminium Co., Ltd.

POST OFFICE.
Extending main supply cables, Rugby Radio Station.—Leicestershire and Warwickshire Electric Power Co.
Telephone exchange equipment.—Llandudno, Sketty, East Grinstead, Sheffield Multi-Exchange Area : Siemens Bros. & Co., Ltd. Romford : Ericsson Telephones, Ltd. Sub-contractors : Crompton Parkinson, Ltd., for charging machines; W. Jones & Sons, Ltd., for ringing machines; Pritchett & Gold & E.P.S. Co., Ltd., for batteries. Foleshill : General Electric Co., Ltd. Nottingham Central, Arkwright, Carlton : Automatic Telephone Mfg. Co., Ltd. Sub-contractors : Electric Construction Co., Ltd., for charging machine; Alton Battery Co., Ltd., for batteries. Synthetic Ammonia & Nitrates, Ltd. (Norton); Automatic Telephone Mfg. Co., Ltd.
Telephone repeater station, 2-wire repeater equipment, Glasgow.—Standard Telephones & Cables, Ltd.
Protective and measuring apparatus.—Ericsson Telephones, Ltd.; Phœnix Telephone & Electric Works, Ltd.; E. Turner.
Telephone apparatus.—Automatic Telephone Mfg. Co., Ltd.; Ericsson Telephones, Ltd.; Plessey Co., Ltd.; Siemens Bros. & Co., Ltd.; Telephone Mfg. Co., Ltd.
Battery stores.—Chloride Electrical Storage Co., Ltd.; Fuller Accumulator Co. (1926), Ltd.
Cable (various).—British Insulated Cables, Ltd.; Callender's Cable & Construction Co., Ltd.; Connolly's (Blackley), Ltd.; Enfield Cable Works, Ltd.; Hackbridge Cable Co., Ltd.; W. T. Henley's Telegraph Works Co., Ltd.; Johnson & Phillips, Ltd.; Pirelli-General Cable Works, Ltd.; Standard Telephones and Cables, Ltd.; Union Cable Co., Ltd.
Castings (joint box).—United Steel Companies, Ltd. (Thos. Butlin & Co. Branch).
Compound.—Dussek Bros. & Co., Ltd.; W. W. Keys, Ltd.; Wilkins, Campbell & Co., Ltd.
Cords for telephones.—Standard Telephones and Cables, Ltd.
Earthenware ducts.—Albion Clay Co., Ltd.; Donington Sanitary Pipe & Firebrick Co., Ltd.; Doulton & Co., Ltd.; H. R. Mansfield, Ltd.; J. Oakes & Co. (Riddings Collieries), Ltd.; Oates & Green; Standard Brick and Terra Cotta Co., Ltd.
Generators.—Telephone Mfg. Co., Ltd.
Erinoid pegs.—B. W. Johnson.
Lead sleeves.—G. Farmiloe & Sons, Ltd.
Insulated staples.—Tower Mfg. Co., Ltd.
Wood troughing.—Calders, Ltd.
Wireless valves.—Standard Telephones & Cables, Ltd.

CROWN AGENTS FOR THE COLONIES.
Alternators.—British Thomson-Houston Co., Ltd.
Cable.—British Insulated Cables, Ltd.
Electrical apparatus.—Revo Electric Co., Ltd.
Electric welding accessories.—Quasi-Arc Co., Ltd.
Fans.—Crompton Parkinson, Ltd.
Generating plant.—Belliss & Morcom, Ltd.; Blackstone and Co., Ltd.; Ruston & Hornsby, Ltd.
Lightning protectors.—Siemens Bros. & Co., Ltd.
Line materials.—Bullers, Ltd.
Meters.—Ferranti, Ltd.
Pole line materials.—J. Spencer, Ltd.
Telephone materials.—Ericsson Telephones, Ltd.; General Electric Co., Ltd.; Standard Telephones & Cables, Ltd.
Train lighting spares.—J. Stone & Co., Ltd.
Wireless apparatus.—Marconi's Wireless Telegraph Co., Ltd.

India (BOMBAY).—Corporation Standing Committee. Accepted :—
Electrical goods (Rs. 4,729).—Greaves, Cotton & Co., Ltd.; (Rs. 532).—Sharma Trading Co.

Electric lamps for 12 months :—

	Rs.
Trinity Electric Syndicate	3,376
Eastern Electric Light and Power Co.	4,162
Sharma Trading Co.	5,152
Ditto, alternative	3,330
BALMER, LAWRIE & Co., LTD. (Accepted.)	5,392
Turner, Hoare & Co., Ltd.	5,392
General Electric Co. (India), Ltd.	5,392
F. & C. Osler, Ltd.	5,392
Yasin Bros.	5,582

Grimsby.—Electricity Committee. Recommended :—
Electric capstan (£252).—Stothert & Pitt, Ltd.
Overhead transmission line to Louth (£5,477).—Johnson and Phillips, Ltd.
Feeder cable and pilot cable in connection with ring main between Old Clee and Tetney (£3,593).—Metropolitan Electric Cable and Construction Co., Ltd.

Manchester.—Health Committee. Accepted :—
Electrical bed lift at Abergele Sanatorium.—Etchells, Congdon & Muir.

Maryborough.—Board of Health.
Installing electric lighting, &c., at the County Hospital :—

Electricity Supply Board. (Accepted.) ...	£144
Brook, Thomas & Co.	156
Haden's Engineering Co., Ltd.	184

—Irish Builder and Engineer.

Portsmouth.—Electricity Committee. Accepted :—
Pumping plant at the Camber (£4,117).—Mather & Platt, Ltd.
H.p. cable (£3,168); l.p. cable (£6,552).—Johnson and Phillips, Ltd.
Two 75-kVA transformers (£110); 12 50-kVA ditto (£505).—British Electric Transformer Co., Ltd.

Reigate.—Rural Council. Accepted :—
Underground main and accessories for the supply of electricity for power to the Merstham outfall works.—County of London Electric Supply Co., Ltd.
8½-h.p. motor and star-delta starter and necessary valves.—Gwynnes Pumps, Ltd.

Seaham Harbour.—Housing Committee Accepted. Electrical wiring at 140 houses £41 14s. 8d. per block of eight, £20 17s. 4d. per block of four and £10 8s. 8d. per block of two.—Harrison Bros.

Shenstone.—
Sub-station equipment.—Crompton Parkinson, Ltd.

Southend-on-Sea.—Town Council. Accepted :—
Fourteen heavy traction poles (£168).—British Mannesman Tube Co., Ltd.
Three miles of trolley wire (£364).—Frederick Smith and Co.
Materials for repairs to battery at Chalkwell Park (£992).—Chloride Electrical Storage Co., Ltd.
Pistons and cylinder heads for Diesel engines (£660).—John Le Boutillier, Ltd.

Walton-on-Thames.—Urban Council. Accepted :—
Changing-over apparatus (£388).—Messrs. Hopkinson.
Special apparatus for wireless installations affected by the change-over.—Mr. Blandford.

Forthcoming Events.

Incorporated Municipal Electrical Association.—June 3rd to 8th. Torquay. Annual Convention.

Illuminating Engineering Society.—Tuesday, June 4th. Royal Society of Arts, John Street, Adelphi, W.C. 7 p.m. Annual general meeting. "Some Further Applications of Synchronously Intermittent Light for Revealing Moving Machinery" Mr. J. F. Crowley.

E.H.P. Conference.—Paris. June 6th to 15th.

Institution of Electrical Engineers.—Summer meeting in France. June 11th to 22nd.

The "Electrical Review" Service Department.

Inquiries must be accompanied by a stamped addressed envelope.

We should be glad to learn the names and addresses of makers of the following :—

A bracket lamp for use over bakers' ovens. The light is switched on automatically when the bracket is extended, and switched off when closed.

The Holborn Explosion.

The Holborn Borough Council, London, has instructed the town clerk to take legal action against the Gas Light & Coke Co. and the Post Office for damage to property of the Council caused by the street explosions last December, due to gas accumulation in a P.O. cable tunnel. As the Postmaster-General is an officer of the Crown, action cannot be taken against him, but the solicitors to the Post Office have agreed to submit the name of an individual against whom proceedings can be instituted.

Notes.

The Paris E.H.P. Conference.

A copy of the programme of the 1929 Conference, which is to be held in Paris, France, from June 6th to 14th, has just been issued. As usual, the papers to be discussed will be divided into three sections, dealing with (i) power production and transformation; (ii) the construction and insulation of lines; and (iii) the operation of networks. The Institution of Electrical Engineers' summer meeting commences on the fifth day of this Conference, and facilities will be afforded for English members to attend the sessions on the last two days. During the following week the members of the E.H.P. Conference will take part in a similar extension to that of the I.E.E. party, by visiting the Pyrenees. This year there are to be only three official British delegates, instead of the eight who could have been appointed. Mr. P. V. Hunter will be the chief British delegate, and he will be supported by Messrs. J. R. Beard and Johnstone Wright. The authors and titles of British papers are as follows :—

Messrs. E. B. Wedmore, W. B. Whitney, and C. E. R. Bruce, "An Introduction to Researches on Circuit Breaking."

Mr. J. E. T. Cogle, "The Effect of Impurities on the Electrical Strength of Insulating Oil."

Mr. S. A. Stigant, "Transformer Inter-Turn Insulation."

Mr. H. S. Holbrook, "The Co-relation of Line and Transformer Insulation."

Messrs. B. D. Goodlet and J. B. Mitford, "The Influence of Atmospheric Conditions on the Performance of Insulators."

Messrs. H. W. Clothier and C. A. Stephens, "High-Tension Switchgear Developments."

Mr. J. R. Beard, "The British 132,000-Volt 'Grid.'"

Mr. R. Borlase Matthews, "Sawn-Timber Supports for Rural Overhead Lines."

Messrs. W. B. Woodhouse and E. B. Wedmore, "Overhead Electric Lines: An Account of the Work of the British Electrical and Allied Industries Research Association."

Messrs. P. D. Morgan and S. Whitehead, "A Study of Methods of Laying a Three-phase System of Single-Conductor Cables."

Mr. L. C. Grant, "Lightning and Surge Propagation in High-Tension Transmission Lines."

Mr. Reginald O. Kapp, "The Selective Protection of Transmission Lines."

Messrs. P. V. Hunter and J. Francis Watson, "Certain Aspects of the High-Tension Distributing Problem."

Mr. W. Fennell, "Supplying Large Areas from the 'Grid System.'"

Mr. G. R. Falkiner-Nuttal, "Load Dispatching on Large Electric Systems in the United States."

A Russian Power Station.

In the article under the above heading in our issue of February 22nd, 1929, in which is described the 80,000-h.p. hydro-electric power station on the River Volchov, credit is given to the Swedish General Electric Co., Ltd. (A.S.E.A.), for having supplied the greater part of the electrical equipment for the installation. It was also suggested that the Metropolitan-Vickers Electrical Co., Ltd., supplied some of the equipment. We understand that the apparatus supplied by the latter firm consisted of phase compensators for the sub-station in Leningrad (Electrical Review, May 17th, 1929, p. 861).

Appointments Vacant.

Assistant consumers' engineer for the West Gloucestershire Power Co., Ltd. Assistant telegraph engineer for the Government of Hong Kong. Mains engineer for Gillingham (Kent) Corporation. Electrotechnical assistant to the city electrical engineer for Salford Corporation. (See our advertisement pages to-day.)

A New Insulator.

According to the *Morning Post*, what is claimed to be one of the best insulating materials yet evolved is included in the exhibition of postal equipment, organised in connection with the Postal Union Congress, at the Grafton Galleries, W. The new insulator is stated to be unbreakable, and makes it possible to dispense, in rural areas, with the unsightly crosspieces and swan-neck insulators of telegraph-poles. The new method of carrying wires consists in passing them through the poles, the holes being fitted with specially designed insulating plugs. Poles used in this way cannot carry a great number of wires, but, both from the practical and artistic points of view, the idea should recommend itself, at least, to the promoters of rural electricity schemes. These poles appear to be similar to those used by the Aylesbury electricity undertaking.

Electrical Traffic Control at Canterbury.

The electrical automatic control system for road traffic recently introduced by Switchgear & Cowans, Ltd., has, with the consent of the Corporation of Canterbury, been erected at the junction of St. Lawrence Road with New Dover Road, and was to be put into operation on Wednesday last. The appara-

tus is specially intended for the purpose of giving to motor traffic on subsidiary side roads joining a main thoroughfare similar protection to that which is afforded by clockwork "robots" at the intersection of main thoroughfares with dense traffic, as is successfully operated in many of our large cities. These robots hold up each cross stream alternately for a fixed time period, while the other stream is allowed to proceed, and obviously are only applicable where the cross streams of traffic are of practically the same density. The S. and C. control is intended to be operated when, and only when, a car is emerging from the side road and allows the main road traffic to proceed without interruption at any other time.

The Installation of Electric Ovens.

The E.D.A. Industrial Heating Sub-Committee notifies the following modification of the London Building Act, 1894, the effect of which is to put the regulations concerning the installation of electric ovens, coppers, boilers, &c., on the same basis as that of similar appliances heated by gas. The Act was passed before the use of electricity for heating was contemplated, and the only exception to that section of the Act that requires special fire-resisting floors under ovens, &c., was made in favour of gas-heated appliances. As a result of representations that Lt.-Col. W. A. Vignoles has made, this exception will now be given to electrical as well as gas appliances. The relative section of the Act reads as follows: *The London Building Act, 1894, Section* 66 (1): "The floor under every oven, copper, steam boiler, or stove, which is not heated by gas and the floor around the same shall, for the space of 18 in., be formed of material of a non-combustible and non-conducting nature not less than 6 in. thick." The amending resolution passed at the meeting of the London County Council held on March 26th, 1929, reads: "That the Council do not object to the fixing of ovens, coppers, steam boilers and stoves heated by electricity without complying with the provisions of Section 66 (1) of the London Building Act, 1924, and that the district surveyors appointed under that Act be informed accordingly."

Fire at the Engineers' Club, London.

A fire which broke out at the Engineers' Club, Coventry Street, W., on May 27th, caused considerable damage. The fire started in a kitchen on the second floor, and spread upward through a service lift, causing damage to each floor and culminating in more damage at the top. The fire was quickly got under control, but the premises was considerably damaged by water.

The "Radioscope."

The "Radioscope" of Mr. G. V. Dowding is shortly to be demonstrated before engineers of the Post Office, who asked Mr. Dowding to allow them to witness a test of the apparatus, and arrangements are being made for equipment to be installed at the Post Office. This move on the part of the Post Office was taken at the suggestion of the B.B.C., which is interested in the invention. The Dowding "Radioscope" comprises a simple home talkie system, whereby any ordinary gramophone can be linked to a small home projector. By means of another simple attachment, the wireless set can be coupled up so as to enable broadcast sound to be supplied in place of the gramophone.

Association of Mining Electrical Engineers.

The South Wales Branch of the Association of Mining Electrical Engineers recently held its annual general meeting at Porthcawl, the retiring branch chairman, Mr. T. S. Thomas, presiding. A large number of members and friends from the parent branch and the western sub-branch assembled at the Esplanade Hotel and combined business with pleasure.

In his annual report the hon. sec., Mr. H. J. Norton, said the membership of the branch was 396, and it still occupied the premier position in the Association. During the year 57 new members were accepted by the Council. Seventeen candidates had sat for the examinations.

Mr. E. D. C. Owens, hon. sec. of the western sub-branch, reported an increase in membership to 102, which was considered satisfactory in view of the difficulties experienced in the district during the year.

The hon. treasurer, Mr. A. C. MacWhirter, reported on the financial position of the branch, and the chairman welcomed the incoming branch president, Mr. W. W. Hannah, A.M.I.E.E., Tredegar, in whose hands he felt sure the affairs of the branch could be left with confidence. Sir A. Whitten Brown, K.B.E., M.I.E.E., Swansea, and Major W. Roberts, A.M.I.E.E., Cardiff, were elected branch vice-presidents, and a ballot for four members of Council resulted in favour of Messrs. J. B. J. Higham, Treforest; G. Probert, Abercorn; F. E. Pring, Pontypool; and H. Pritchard, Aberaman.

A New Electric Totaliser.

Automatic indication of totals of various accumulating quantities is now possible, it is claimed, by the use of electrical equipment recently perfected in the United States. The equipment, developed for the totalisation of electric power demand originating from a large number of sources, can be applied to the quick and accurate totalling of units of several different numerical values. The totals involved may be indicated in several places, by means of large or small indicators. A typical application might cover the sale of tickets of different monetary values, from perhaps 50 different ticket windows. Whether the sales occur successively or simultaneously, the totalising equipment will function and correctly total all sales. Such a ticket-totalling equipment has been designed and built, and involves the use of a motor-driven ticket machine. A key is depressed in the usual manner to issue a ticket of a specified value. This starts the motor, which runs until the ticket is cut off and ejected through an opening in the top face-plate of the machine. During this operation an electric circuit to the totalising machine is momentarily interrupted. Each key is associated with two registers of the "Veeder" counter type, one registering continually while the other can be re-set to conform with the serial number of tickets issued. An impulse-collecting device responds to the ticket machine operation, and operates to place an impulse in the totalising device. The impulse is registered in the totalising device with a definite numerical value equivalent to the ticket value. Indication of the totals can be made on small indoor-type indicators for totalising in various numerical units. Indication may also be given on large scoring-board signs, where the figures are formed by electric-light bulbs. An interesting application of this equipment is being considered in connection with some pari-mutuel race meetings in the United States.

Rural Electrification in Australia.

Commenting on a letter in *The Age* regarding the supply of electricity to dairy and other farmers in Victoria, Australia, the Electricity Commission said appreciable progress had been made. The Commission was the only electrical authority which had extended supplies beyond the boundaries of any particular town; the supersession of small generating undertakings by a comprehensive system of transmitted energy was the only chance for farmers to obtain supplies of electricity, and the continued existence of small generating undertakings would militate against the electrification of the State, especially in small and scattered farming communities. Each extension of transmitted energy, such as that arranged for Ballarat, Bendigo, and other places, brought whole districts within range of supply. At present the Commission supplied 200 farmers, nearly 50 butter factories were using energy, and in the Western district 114 farmers were using electrical energy. This number represented 29 per cent. of farms within one-eighth of a mile of the feeder lines in the district. All the supplies had been given by the Commission in four years. In the aggregate 32 motors totalling 87 h.p. were employed by the farmers for milking, separating, wood cutting, chaff cutting and other duties, and extra power was being added every year. Between the townships of Terang and Mortlake 48 farms out of a possible 57 were supplied with electricity from the Commission's mains. In the Gippsland district Tyers was a completely electrificed farming community. The consumers, which included a butter factory and a saw mill, numbered about 30.

New Zealand had a long start of Victoria in transmitted supply, as well as in intensive rural co-operative activities. Settlement was much closer and the farming more intensive, thus facilitating greater extension of supply. Supplies to farmers in New Zealand were given under revenue guarantees as they were in Victoria, but any loss on lines was a charge against rates, so that, apart from the ready facilities available, the urge to use electricity was much greater on ratepayers than in Victoria, where the Commission had to bear losses.

Some farmers in Victoria had complete electrical installations, including heaters for the hot water used in their dairies. One farmer in the Western district had shown extreme ingenuity in arranging his line shafting, with the result that one 3-h.p. motor did milking, separating, wood cutting, chaff cutting and corn grinding. He also had a heater of five gallons capacity, which, for a cost of 7s. per month, met all the hot-water requirements of his dairy. These services included lighting for the house, and the whole cost was approximately £23 per annum. The cost, however, varied for different farms. In the Western district the average cost over the number supplied was £17 a year. In some parts of New Zealand a charge of £20 per annum was made for a 2-h.p. motor for milking purposes only. The Commission gave every assistance to a farmer in erecting his private service line, which might extend for some distance across his property, and would give a firm quotation for the erection of the line, or would supply and erect the cable upon the consumer's own poles; or the consumer could build the line himself, or obtain the services of a private contractor.

The W. E. Highfield Shield Competition.

The Association of Supervising Electrical Engineers announces the seventh annual competition for the W. E. Highfield Shield. In addition, five prizes will be offered, three to members and two to associates; the value of the prizes will range from £1 1s. to £4 4s. Papers to be of about 1,000 words. Subjects of papers must refer to the electrical industry and/or the Association. All papers must reach the head office not later than 12 o'clock, noon, on September 2nd, 1929.

The Electrical Association for Women.

At the invitation of the Great Western Railway a party of 100 members of the Electrical Association for Women inspected the electrically-operated machinery at Cardiff Docks on May 22nd. Among the appliances inspected were the hydro-electric power house, movable coal hoists, cold stores, merchandise, and food-handling machinery.

Institution Notes.

Institution of Electrical Engineers.

Meter and Instrument Section.—The Committee of the Section has made the following nominations to fill the vacancies which will occur on the Committee on September 30th, 1929:—*Chairman:* Mr. E. W. Hill (Aron Electricity Meter, Ltd.). *Ordinary members of Committee:* Messrs. E. Fawssett (Newcastle-upon-Tyne Electric Supply Co., Ltd.); A. J. Gibbons (London Power Co., Ltd.); E. H. Miller (British Sangamo Co., Ltd.); and R. S. J. Spilsbury (National Physical Laboratory).

Institution of Mechanical Engineers.

About 80 members of the Yorkshire branch of the Institution visited the works of Messrs. Hopkinsons, Ltd., Huddersfield, on May 16th, and inspected the plant, which ranks amongst the finest of its kind in the world.

The inspection of the works lasted exactly two hours, and demonstrations were given of the new Hopkinson centrifugal separators. The visitors were entertained at tea by the firm at the conclusion of their tour. Mr. Robert Hopkinson, who presided at tea, welcomed the delegates. Prof. F. C. Lea, of Sheffield University, president of the Institution, thanked the firm, and Prof. A. J. Margetson, in seconding, said that it was interesting to see in the works the notices urging the avoidance of waste of both materials and time. Engineering firms, he added, did not make profits—they saved them out of possible losses—and that was the only way in which they could keep their heads above water in engineering. Major F. L. Watson, in supporting, said that in these days when everyone was saying that England, particularly in engineering, was fast asleep, it was interesting to visit an establishment where it was obvious that everyone's eyes were very wide open to anything which might improve the product, or the work of its production, or find a new outlet for their energies. Mr. Robert Hopkinson returned thanks.

Our Personal Column.

Electrical men are invited to enable us to keep readers of the "Electrical Review" posted concerning their movements.

Mr. C. O. Brettelle, M.I.E.E., has been appointed Technical Editor of the Electrical Review in succession to the late Mr. Arthur Hinton Allen. Mr. Brettelle received his general education at Clifton College and his technical training at the Merchant Venturers' Technical College, Bristol, and at Bristol University College. His subsequent career included positions with the Bristol electricity undertaking, the North-East Coast Group of Power Companies, and also with Messrs. Merz & McLellan, consulting engineers, Westminster. He was at different times chairman and hon. secretary of the Tees-side Sub-Centre of the I.E.E., and for many years held the position of honorary assistant editor of the *Electrical Power Engineer*. Mr. Brettelle was entertained at luncheon by his former colleagues on Saturday last, and was the recipient of a case of pipes and other useful instruments suited to his new position.

The marriage took place on May 23rd of Mr. G. M. Pearson, B.Sc., and Miss Mary Vernon, Nelson. For some years the bridegroom was employed by a Manchester firm of electrical engineers. He has since secured an appointment as engineer for an electrical scheme at Rio de Janeiro.

Mr. Robert Blackmore, who has been appointed engineer by the Central Electricity Board for the North-West England and North Wales Electricity Scheme, on resigning the position of engineer-in-chief to the Stalybridge, Hyde, Mossley, and Dukinfield Tramways and Electricity Board, was presented last week with an illuminated address by the members of the Board and with a canteen of cutlery by the Board and staff.

The *Sydney Morning Herald* recently announced the appointment of Mr. V. J. F. Brain, B.E., as chief electrical engineer to the N.S.W. Public Works Department, in succession to Mr. H. G. Carter. Mr. Brain is an Australian by birth and received his electrical training in the United States. His last position was that of assistant electrical engineer in the Electrical Engineering Department of the New York Edison Co.

Mr. G. W. Essex, assistant secretary, has been appointed assistant general secretary of the Electrical Power Engineers' Association, consequent upon the resignation of Mr. J. W. Thomas (*vide* Electrical Review, May 3rd, p. 796). Mr. Essex will have control of all negotiations and propaganda work. Mr. J. F. Wallace, regional secretary, takes the place of Mr. Essex, while Mr. G. E. Love, late deputy chief engineer at Halifax, is appointed an additional district secretary. Mr. J. W. Thomas has accepted the position of hon. secretary of the North-Western Centre of the I.E.E.

The marriage took place in the Cathedral, Singapore, on February 23rd, of Mr. G. B. Page, son of Mr. and Mrs. D. G. Page, of Sutton Coldfield, Eastern representative of the Macintosh Cable Co., Ltd., to Miss Dorothy Muriel Richardson, of London.

At the annual meeting of Sir W. G. Armstrong, Whitworth and Co., Ltd., last week, it was announced that Maj.-Gen. G. P. Dawnay would become chairman as from June 1st, and Lt.-Col. P. D. Ionides, D.S.O., vice-chairman.

Mr. Walter T. Young, the Halifax borough tamway manager, has been appointed also as manager for the newly-established joint committee of the L.M.S. and L.N.E. Railways and the Halifax Corporation, running motor-'bus services in the district.

As we briefly reported in our last issue, Mr. W. A. Valentine, C.B.E., is retiring from the position of Controller of the London Telephone Service. Mr. Valentine, whose portrait accompanies this note, has been connected for 43 years with the British telephone system. With the National Telephone Co. he filled various positions at Stirling, Kirkcaldy, Inverness, Manchester, and Glasgow. When the telephones were taken over by the General Post Office on January 1st, 1912, he transferred to the State service, and shortly afterwards became a provincial superintendent at the London headquarters. In 1916 he was appointed deputy-controller in the London Telephone Service, and upon the retirement of Mr. G. F. Preston, C.B.E., six years ago, became Controller.

Mr. Valentine has seen a great expansion of the service during the last ten years, including the commencement of the conversion of the London System from manual to automatic working. This is a gigantic undertaking on the part

Miles & Kaye [*London.*

Mr. W. A. Valentine, C.B.E.,

who is relinquishing the Controllership of the London Telephone Service.

of the Post Office engineers, as the service has to be maintained in a high state of efficiency during the change-over, which may be spread over from ten to fifteen years. Other departments in which there has been notable development are the Anglo-Continental telephone service and the radio service between this country and the North American Continent.

We trust that Mr. Valentine will enjoy many years of rest after laying down the great responsibilities which he has carried so well during a long period of national service.

The appointment of Mr. F. W. PURSE as chief engineer to the London and Home Counties Joint Electricity Authority hardly comes as a surprise, for Mr. Purse has acted as technical adviser to the Board for nearly a year, while his 30 years' experience and undoubted merit have qualified him for a bigger job than his present one, although to be borough electrical engineer of West Ham is no mean task.

While Mr. Purse has been in municipal service during the whole of his career, he has done a tremendous amount of work in many branches of the electrical industry. He is

Photo by [*Russell*

Mr. F. W. Purse, M.I.E.E., M.I.Mech.E.

The New Chief Engineer to the London and Home Counties J.E.A.

a past-president of the I.M.E.A., and on the occasion of his election to that position we published a biographical sketch (ELECTRICAL REVIEW, June 17th, 1927, p. 959). Other bodies which have benefited from his advice and assistance are the Institution of Electrical Engineers, the British Electrical Development Association, the National Register of Electrical Installation Contractors, the British Electrical and Allied Industries Research Association, the Institute of Fuel, the Illuminating Engineering Society, the British National Committee of the World Power Conference, the British Engineering Standards Association, and several other institutions. His standing in the electricity supply industry was officially recognised by his appointment to the Electric Fittings Statutory Committee (1926 Act) and the Commissioners' Special Committee on Tariffs. He has acted as adviser to a number of municipal supply authorities and is an active Rotarian. We reproduce Mr. Purse's portrait herewith and extend to him our heartiest congratulations upon his new appointment. The Joint Authority can also be congratulated upon its wise choice.

The Council of the Birmingham Chamber of Commerce has appointed Mr. C. ELLIOTT, B.Sc., A.M.Inst.C.E., A.M.I.Mech.E., general manager of the Birmingham Section of the British Industries Fair in the place of Mr. C. Stanley, whose death was reported in our issue of March 22nd (p. 530).

Mr. W. E. WARRILOW, A.M.I.E.E., has been appointed by Edison Storage Batteries, Ltd., to the position of assistant manager to Mr. Maurice E. Fox, managing director. Some of our readers may remember that in 1913 Mr. Fox and Mr. Warrilow advocated the revival of storage battery traction in this country, and brought an Edison battery pleasure car under its own power from Dumfries to London, taking boosting charges along the road. Mr. Warrilow's address will be Victoria House, Vernon Place, Southampton Row, W.C.2.

Mr. W. M. SELVEY, of 64, Victoria Street, Westminster, is proceeding early in June to the United States and Canada for a tour of inspection of power stations, &c. One object of his visit is to obtain first-hand information as to the available American experience in the problems of the emission of dust grit and fumes from power station chimneys.

Mr. JAMES GRAY, M.A., M.C., has been elected a Fellow of the Royal Society. Mr. Gray is son of the managing director of the Electric Construction Co., Ltd.

Dr. ING. ALEXANDER MEISSNER, chief of the research laboratory of the German Telefunken Co., has been awarded the Ernst Abbe memorial prize and medal for his work in connection with the development of radio transmission and reception. He has also been made a vice-president of the Medal of Honour Institute of the American Institute of Radio Engineers.

The Darlington Gas, Water and Electricity Committee has recommended the appointment of Mr. W. N. SMITHSON, of Hurworth-on-Tees, as hiring and sales superintendent for a period of 12 months, at a salary of £250 per annum, plus commission. Subject to satisfactory service, the appointment is to be made permanent, with a salary of £300 a year, plus commission.

The Birkenhead Town Council, at a recent meeting, confirmed the appointment of Mr. F. W. BRECKNELL, A.M.I.E.E., as deputy borough electrical engineer. For the past two years Mr. Brecknell has held the position of chief assistant engineer in the Birkenhead undertaking, and prior to that was for many years power station superintendent.

Obituary.—MR. C. H. HIGGINS.—We regret to record that Mr. C. H. Higgins, engineer-in-charge at the Islington Borough Electricity Works, passed away after a long illness on Saturday, May 18th. The funeral took place at Finchley Cemetery on May 23rd.

MR. H. J. MARSHALL.—We learn with regret of the death of Mr. Herbert J. Marshall, chairman and managing director of Messrs. Marshall, Sons & Co., Ltd., the well-known Gainsborough engineers.

Will.—The late Mr. BERNARD A. FIRTH, chairman of Thos. Firth & Sons, Ltd., and a director of a number of other companies, including the English Electric Co., Ltd., left £476,992 gross and £367,396 net personalty.

Financial Section.

New Companies, Returns of Share Capital, Debenture Changes, Reports of Electrical Companies, Dividend Results, Transactions in Stocks and Shares.

New Companies Registered.

Acme Electric Welding and Marine Scaling Co., Ltd.—Private company. Registered in Edinburgh on May 18th. Capital, £2,500 in £1 shares. Objects:—To carry on the business of electric and oxy-acetylene welders, boiler makers and repairers, braziers, ironfounders, metallurgists, ship scalers, engineers, boat builders, &c. The directors are:—W. R. Sneddon, 225, Auldhouse Road, Newlands, Glasgow, electric welder; R. Brown, 82, Ares Drove, Mosspark, Glasgow, electric welder. Registered office: 59, Govan Road, Glasgow, S.W.1.

Ideal Wireless Co., Ltd.—Private company. Registered May 24th. Capital, £6,000 in 5,000 8 per cent. cumulative preference shares of £1 each and 20,000 ordinary shares of 1s. each. Objects: To carry on the business of manufacturers of and dealers in all kinds of radio apparatus or parts thereof, gramophones, &c. The subscribers (each with one preference share) are:—Nancy S. Perkins, 92, Leeside Crescent, Golders Green, N.W.11; and Marie Dreyfus, 5, John Street, Bedford Row, W.C.1, solicitor's clerks. The first directors are to be appointed by the subscribers. Solicitors: Richardson Sowerby, Holden & Co., 5, John Street, Bedford Row, W.C.1.

Electric Carbons and Supplies, Ltd.—Private company. Registered May 15th. Capital, £100 in £1 shares. Objects: To carry on the business of electrical, mechanical, and automobile engineers, manufacturers of and dealers in radio receivers, television instruments, kinema apparatus, carbons, projectors, &c. The provisional directors are:—T. J. Nesbitt, 554, Scott Hall Road, Chapel Allerton, Leeds; and N. Hill, 9, Park Spring Gardens, Bramley, Leeds, accountant's clerks. Secretary: T. J. Nesbitt. Registered office: 73-5, Albion Street, Leeds.

British Filograph Co., Ltd.—Registered as a public company May 22nd. Capital, £125,000 in 2s. shares. Objects: To adopt agreements with Filograph (Parent) Co., Ltd., W. F. Croll, and W. E. Adolph; to acquire patents and patent and other rights relating to inventions for recording and reproducing sound by means of a thread; to manufacture and distribute machines for recording and reproducing all forms of thread and other records, and to carry on the business of manufacturers of and dealers in gramophones, phonographs, kinematograph films, radio instruments, telephones and appliances for the recording, production and reproduction of sound of every description, theatre proprietors, &c. The subscribers (each with one share) are:—L. G. D. Croft, St. Audries, Purley, articled clerk; W. E. Furby, 11, Owens Row, E.C.1, clerk; and five others. The first directors are to be appointed by the subscribers. Solicitors: Kenneth Brown, Baker, Baker, Lennox House, Norfolk Street, Strand, W.C.2.

Orchestrian Products, Ltd.—Private company. Registered May 22nd. Capital, £4,000 in 3,000 ordinary shares of £1 each and 20,000 deferred shares of 1s. each. Objects: To carry on the business of manufacturers of, and wholesale or retail dealers in radio and electrically amplified gramophones, amplifiers and apparatus, kinematograph machines, &c. The subscribers (each with one deferred share) are:—W. Clark, 45, Church Street, Leigh, incorporated accountant; J. Cohen, 9, Carlisle Place, Bradford, jeweller; H. G. Ascher, 8, Acomb Street, Chorlton-on-Medlock, Manchester, glass manufacturer; P. Cohen, 9, Carlisle Place, Bradford, gramophone manufacturer. Secretary (*pro tem.*): W. Clark.

Auto Call Co., Ltd.—Private company. Registered May 22nd. Capital, £1,000 in £1 shares. Objects: To carry on business as electrical engineers, to let on hire, hire-purchase, sell, deal, and manufacture articles of an electrical, mechanical, industrial or decorative character, &c. The subscribers (each with one share) are:—S. C. Russ, Hillview, Brockham Green, Betchworth, and C. R. Bates, Rosecroft, Hare Lane, Claygate, electrical engineers. Registered office: 27, Martin Lane, Cannon Street, E.C.4.

Electric Spelling Signs, Ltd.—Private company. Registered May 22nd. Capital, £5,000 in £1 shares. Objects: To acquire from W. Stafford the benefit of certain patents and foreign rights relating to electric sign controllers, &c. The first directors are:—H. H. Llewellyn, Inglemere, Arnside, Northumberland; F. Seyffert, 26, Hayter Road, S.W.2; R. Collier, 1, Elm Park Road, South Norwood (technical director). Registered office: 11, Southwark Street, S.E.1.

Chasetown & District Electricity Co., Ltd.—Registered as a public company May 25th. Capital, £100,000 in £1 shares. Objects: To acquire the business of electricity distribution authorised by the Chasetown and District Electricity Special Order, 1924, and carried on by the Cannock Chase Colliery Co., Ltd. Purchase consideration £62,130 in fully paid shares. The directors are:—Capt. W. M. McClean, 1, Onslow Gardens, S.W.7; Lt.-Col. Sir Frances K. McClean, A.F.C., Huntercombe Place, Henley-on-Thames; Lt.-Col. H. F. Bidder, D.S.O., Ravensbury Manor, Mitcham, Surrey; Major J. M. Griffin, Bourn Hall, Cambridge; Sir Nicholas E. Waterhouse, K.B.E., 2, Swan Walk, Chelsea, S.W.3; G. P. Bidder, D.Sc., Cavendish Corner, Cambridge; S. F. Sopwith, Chasetown, near Walsall. Registered office: Parliament Mansions, Victoria Street, S.W.1.

Official Returns of Electrical Companies.

William Maxwell & Co., Ltd.—Charge on Tudor Lodge, 204, Goldhawk Road, Shepherd's Bush, dated April 12th, 1929, to secure £2,000. Holder: S. T. Hurley, Briar Lodge, Askew Road, Shepherd's Bush.

British Shade Manufacturers, Ltd.—First mortgage debenture, dated May 2nd, 1929, to secure £400, charged on the company's undertaking and property, present and future, including uncalled capital and book debts. Holder: Miss E. de la Haye, 71, Bromsgrove Street, Birmingham.

J. J. R., Ltd.—Satisfaction in full on May 6th, 1929, of debentures dated February 3rd, 1928, securing £250.

L.P.S. Electrical Co., Ltd.—Debenture charged on the company's undertaking and property, present and future, including uncalled capital, dated April 23th, 1929, to secure all moneys due or to become due from the company to Barclay's Bank, Ltd.

Flexible Electric Cords, Ltd.—Satisfaction in full on January 21st, 1929, of debenture dated September 8th, 1927, securing £500.

Debenture dated May 13th, 1929, to secure £500, charged on the company's undertaking and property, present and future, including uncalled capital. Holder: W. C. H. Polter-Mackenrot, 60-64, Artillery Lane, E.C.1.

Symper & Evershed, Ltd.—Particulars filed of £500 debentures, authorised April 23rd, 1929, charged on the company's property, present and future, including uncalled capital, the whole amount being now issued.

Viozone, Ltd.—Second debenture dated April 24th, 1929, to secure £148 4s. 5d. charged on the company's undertaking and property, present and future, including uncalled capital. Holders: Expert Marketing Co., Ltd., 19, Cursitor Street, E.C.4.

New Lowca Engineering Co., Ltd.—H. Mossop, Ramsden Square, Barrow-in-Furness, ceased to act as receiver on May 3rd, 1929.

Surrey Wholesale Electrical Co., Ltd.—Capital, £1,000 in 500 "A" shares of £1 each and 10,000 "B" shares of 1s. each. Return dated November 14th, 1928. 451 "A" and 8,600 "B" shares taken up. £275 paid on 101 "A" and 3,600 "B" shares. £6 in arrears. £600 considered as paid on 350 "A" and 5,000 "B" shares. Mortgages and charges, nil.

H. D. Douglas & Co., Ltd.—Capital, £1,000 in £1 shares. Return dated December 28th, 1928 (filed March 14th, 1929). Two shares taken up. £2 paid. Mortgages and charges, nil.

Looe Electricity Co., Ltd.—Return dated April 24th, 1929. Capital at date of return, £6,000 in £1 shares (increased April 26th, 1929, to £8,000 in £1 shares). 5,900 shares taken up. £5,900 paid. Mortgages and charges, £1,451 16s. 3d.

Johnson & Murrell Electric Co., Ltd.—Capital, £5,000 in 1,000 preference and 4,000 ordinary shares of £1 each. Return dated December 31st, 1928 (filed April 4th, 1929). 1,000 preference and 2,200 ordinary shares taken up. £1,700 paid on 250 preference and 1,450 ordinary shares. £1,500 considered as paid on 750 preference and 750 ordinary shares. Mortgages and charges, nil.

A. Franks (Wholesale), Ltd.—Capital, £10,000 in £1 shares. Return dated December 31st, 1928 (filed April 20th, 1929). 4,000 shares taken up. £4,000 paid. Mortgages and charges, nil.

Sennybridge Electric Supply Co., Ltd.—Capital, £1,500 in £25 shares. Return dated June 30th, 1928 (filed March 22nd, 1929). 48 shares taken up. £1,200 paid. Mortgages and charges, nil.

Reason Manufacturing Co., Ltd.—Capital, £52,500 in 200,000 preference and 10,000 ordinary shares of 5s. each. Return dated March 25th, 1929. 93,260 preference and 10,000 ordinary shares taken up. £2,664 5s. paid on 10,657 preference shares. £23,150 15s. considered as paid on 82,603 preference and 10,008 ordinary shares. Mortgages and charges, £22,217 (bank overdraft).

K.T.B. Manufacturing Co., Ltd.—Particulars filed of £4,000 debentures authorised April 4th, 1929, charged on the company's undertaking and property, present and future, including uncalled capital, the amount of the present issue being £600.

City Notes.

Siemens Bros. & Co., Ltd.

The annual meeting was held on Monday last, Lord Queenborough, G.B.E. (chairman) presiding. In proposing the adoption of the report (*vide* our last issue, p. 930), the chairman, dealing first with the balance-sheet, said, *inter alia*, that materials, manufactured goods and work in hand at £1,013,970 were up by £108,468, due to there being more work in progress and to the provision of an increased stock of component parts to deal more quickly with orders. The net assets of the Colonial agencies—£439,955—had increased during the year by £21,180, due to a larger volume of overseas business. The investment in Caxton Electric Developments remained at £670,000, and was represented largely by assets which could be quickly converted into cash. Proceeding to deal with the manufacturing and trading activities of the company, his lordship said that there had been an almost entire absence last year of any labour difficulties. Moreover, they might regard the future hopefully in this respect owing to the steps that were being taken towards establishing and maintaining industrial peace. With regard to submarine cables, the year had been characterised by the growth and development of "rationalisation." Great combinations or groups of companies had been and were being formed in order

to secure the benefit of economic production and administration, thus strengthening their competitive power in the world's markets. He quoted as an example the Wireless-Cable merger. So far as their company was concerned, as they had for more than 50 years contributed largely to the advancement of the art of telegraphy, it was not unreasonable to assume that they would continue to play their part and secure their share, as manufacturers of submarine cable and apparatus, in any development of overseas communications which the new Communications Company might initiate. During the past year they manufactured a submarine telegraph cable for the Philippine Islands. The company had always been intimately associated with the development of submarine telephone cable; during the past year further progress had been made with new designs to meet the ever-increasing demands for long-distance submarine telephonic transmission. They were entrusted by the Government with the manufacture of the new submarine telephone link between this country and Northern Ireland, *via* the Isle of Man. That cable would shortly be laid by their c.s. *Faraday*. They had also manufactured other submarine telephone cables of unique construction so far as this country was concerned, one being laid from the mainland to the Isle of Wight, the other being intended for service in the Gulf of St. Lawrence. With regard to underground power cables, the screened type of "super-tension" main for the transmission of power, introduced by the company into this country a few years ago, had now, in one form or another, become a standardised type for many purposes, and their plant for its manufacture had been fully occupied throughout the year. Amongst contracts carried out for electricity supply undertakings in different parts of the world, he might mention that an order of considerable magnitude for 33,000-V cables received from the Bristol Corporation had recently been duplicated. A number of "super-tension" cables which the company supplied and laid across Sydney Harbour were the largest cables which had ever been made for any purpose. Although the output of underground telephone cables was considerably greater than in the preceding year, the plant was not working to its fullest capacity. There was still much leeway to be made up in this country before we reached the high level of telephonic facilities provided in other countries. There had been a considerable demand during the past year for manual and automatic telephone exchanges and apparatus both at home and overseas. Among contracts received from the Post Office were those for three exchanges in connection with the conversion of the London system to automatic, and in the provinces exchanges and extensions in the Dudley, Brighton, and Edinburgh areas, besides exchanges or extensions for Ardwick (Manchester), Winchester, Deal, Mumbles, Kirkcaldy, Stockport, West Bromwich, Swansea, Sketty, and Hitchin. Abroad, contracts for exchanges or extensions had been secured, among others, from Canada, South Africa, China, India, Australia, and Japan. The exchanges for China for the Hong Kong area had a total of 13,000 lines and represented by far the largest automatic exchange equipment supplied to the Far East. The important automatic exchange at Kensington, known as "Western," for which the equipment was manufactured and installed by the company, came into operation in the first week of this year. The change-over from manual to automatic was effected successfully, and the exchange had continued to function satisfactorily. The company had recently developed a rural exchange system for one of the Dominions. This exchange had been specially designed for the particular conditions obtaining among sparsely-populated rural communities, often 20 miles removed from the nearest township. Regarding prospective business, they had substantial contracts for exchange equipment and apparatus on their books both for home and overseas customers, but unfortunately, owing to severe competition, much of the work had to be taken at unremunerative prices. The company had developed, in co-operation with the Post Office engineers, a new type of telephone instrument, known as the "Neophone." An initial contract for 50,000 of those instruments had just been placed with them by the Post Office which, after exhaustive tests, had found them to be a real advance in transmission efficiency and articulation. It was also hoped, in consequence of its use, to achieve considerable economies in the copper section of the local distribution systems by the use of this one universal type of transmitter throughout all the different areas, which feature was hitherto only achieved by using different patterns for different zone distances. There had been a very great increase in the demand for radio batteries, which had led to growing imports from the Continent, but the public was learning the advantage of using the higher class of batteries such as the company specialised in. As a consequence, their output of batteries was much larger and the cost considerably lower, which had enabled them to reduce their prices. Their marine specialities were being increasingly adopted by the larger shipping companies and shipbuilders, in particular, their electrical ships' telegraphs and marine pyrometers, and the Ford torsionmeter maintained its popularity on British and foreign ships; in marine wireless they had introduced a reliable device for ships which had been approved by the G.P.O. and the Board of Trade, for which there was a gratifying demand. The increase in the proportion of foreign business which entered into their turnover was referred to in the report. Such an increase was necessary for the prosperity of the country, but the competition for the business was extremely keen, and prices had to be very low indeed to secure an adequate share of it. But it was indispensable that they obtained such a share in order to be able to spread their overhead charges over a sufficiently high output. Important negotiations had taken place during the last year with two large foreign concerns interested in the same line of business as the company. Those negotiations had reached their final stages, and the agreements could be executed as soon as certain changes in their articles of association, now long overdue, had been made. He would have to defer any announcement of details until necessary formalities had been completed. The proposed changes in the articles of association did not in any way affect the percentage of foreign holding and voting power; and the safeguards provided in the articles to ensure that the control of the company could not pass into foreign hands were not only fully maintained, but even strengthened by the proposed changes.—Sir W. R. Lawrence, Bt., seconded the motion, and the report was adopted without discussion. An extraordinary general meeting followed, at which a resolution was passed for effecting the alterations in the articles referred to by the chairman. These provided, *inter alia*, for the deletion of words referring to "enemy states."

Stock Exchange Notices.

Dealings in the following have been allowed by the Committee under Rule 159:—

Bank of England "Certificates of Registration" representing:—

Ordinary stock of the Eastern Telegraph Co.
Ordinary shares of the Eastern Extension, Australasia and China Telegraph Co. of £10.
Ordinary shares of the Western Telegraph Co. of £10.
7 per cent. cumulative participating preference shares of £1 of Marconi's Wireless Telegraph Co.
Ordinary shares of £1 of Marconi's Wireless Telegraph Co.
Ordinary shares of 10s. of Marconi's Wireless Telegraph Co.

Anglo-Portuguese Telephone Co., Ltd.—113,002 new ordinary shares of £1 each, fully paid, Nos. 465,061 to 578,072. 5,000 ordinary shares of £1 each, fully paid, Nos. 578,073 to 583,072.

Hydro-Electric Securities Corporation.—$20,000,000 5 per cent. "B" cumulative participating preferred stock in shares of $10 each fully paid (ex option).

The undermentioned securities have been ordered to be officially quoted:—

Barcelona Traction, Light and Power Co.—287,250 ordinary shares of $50 each, fully paid; 251,934 7 per cent. non-cumulative participating preference shares of $100 each, fully paid; and £1,677,060 5 per cent. first mortgage 50-year bonds, within Nos. A1 to A127,500 and A174,501 to A320,000 (£20) and B1 to B25,550 (£100).

Enfield Cable Works.—100,000 ordinary shares of £1 each, fully paid, Nos. 250,001 to 350,000.

Ferranti, Ltd.

The Manchester correspondent of the *Financial Times* reports that the directors propose to capitalise £40,000 of the general reserve and to distribute it in the form of ordinary shares to the present holders of ordinary shares in the proportion of two new shares for each three held.

British Electric Transformer Co., Ltd.

The annual meeting was held on May 21st, Mr. A. F. Berry (chairman) presiding. In proposing the adoption of the report (*vide* ELEC. REV., May 17th, p. 887), the chairman said that in the balance-sheet there was an addition of £5,408 to freehold land, premises, &c., which was mainly made up by expenditure on special testing plant, sundry further plant and machinery, together with a new building to house some special apparatus in their works at Hayes. There was a decrease of £30,292 in the gross profit on trading, which was due to the difficulties and price-cutting encountered during the year and referred to in the report. That decrease was again reflected in the decrease of the net profit for the year under review. In view of the position generally, it was decided to postpone further consideration of the payment of the preference dividend for the latter half of the year pending the sale of some of the company's properties; the dividend was cumulative. There was no possibility of considering the payment of an ordinary dividend, but as he had told them last year, in view of the difficulties ahead they were fortunate in then receiving a dividend of even 5 per cent. Last year he said that the depression of industry had caused a competition which had practically destroyed co-operation, and that although they had received considerable orders, the prices were very poor. In the past three years they had each year turned out apparatus capable of dealing with more horse-power. It was clear, therefore, that they had done a great deal of additional work for a very poor return. Neither home orders nor those for export showed an adequate profit. Some of the work carried out was of the very highest character and class. In export work, he might mention that done in connection with the electrification of the Great Indian Peninsula Railway. A visit was paid last year by their secretary (Mr. Wrist) to Australia in connection with the affairs of the Australian company, which was now about to commence manufacture. Mr. Wrist visited a number of other countries with which they did business, and it was anticipated that the company would in due course reap the benefit of those visits. In spite of the lack of reward, it would be unwise to under-estimate the

value that such a period of test and cleansing conferred upon an old-established business such as theirs. There were indeed several benefits of a lasting order that had accrued to the company thanks to the intense efforts on the part of directors, staff, and all concerned in meeting such stern competition. In the first place, methods of manufacture, design and similar matters had to be overhauled with a view to enforcing the strictest possible economy. In the second place, there was a tendency, when competition became so fierce, for weaker competitors to fall behind and even drop out altogether. Above all, there was a fitness and strength to go ahead in more prosperous times that was born of the struggle for the survival of the fittest. He hoped that the step back which they were now taking might prove to be preliminary to the biggest jump forward in years to come that they had ever known. The manufacture of special lamps for "Sun-ray Tricity" radiators, which they produced, was made necessary by the growing popularity of this section of the business. Consequently they now controlled an electric lamp business in addition to their older-established transformer, heating and cooking businesses. Incidentally, they were all doubtless aware that the manufacture of electric lamps had proved most profitable genera'ly—so profitable in some cases that manufacturers of popular lamps had been able to invade their transformer business and cut prices seriously. With regard to the future, he could see definite signs which led him to believe that years of great promise lay ahead of them. The large additional orders referred to in the directors' report were of themselves an indication of great national activity, and they might expect in the next year to begin to share in that national prosperity which should come to the electrical and allied trades. Mr. F. E. Berry seconded the motion, which was carried unanimously.

Electric Furnace Co., Ltd.

The first annual report of this company, covering the year ended March 31st last, has been published. It shows that of an authorised capital of £200,000, £158,043 has been issued. The accounts record a profit of £16,047, and the directors recommended a dividend at the rate of 7 per cent. per annum on the preferred ordinary and ordinary shares from the date of incorporation to March 31st last. From the balance (£9,577) it is proposed to transfer £5,000 to reserve and to write £2,416 off preliminary expenses, leaving £2,161 to be carried forward. The report states that the past year has been marked by great activity in the development of high-frequency metal melting and numerous orders for equipment have been received. In many cases the installations are subject to tonnage royalties, which represent an important future source of income. The patent position has been fortified by working agreements with Associated Electrical Industries, Ltd., and important groups in France, Germany and Sweden. The contracts have been widely distributed, and the company's French connection has produced a large proportion of the revenue. Premises for demonstration, development and service work have been acquired in Birmingham, and a great deal has been spent on fruitful research. The outlook for the current year is encouraging. Lt.-Col. the Hon. O. H. Stanley, D.S.O., has been appointed a director. Meeting: To-day (Friday).

The Central Electricity Board Issue.

On Saturday last the Central Electricity Board offered for subscription, through the Bank of England, £3,000,000 of 4 per cent. stock at £83 per cent., redeemable at par on May 1st, 1989, or at any interest date after May 1st, 1959. Interest is to be paid half-yearly on May 1st and November 1st. The stock and interest are a first charge on the whole undertaking and net revenues of the Board, but power is reserved to create and issue further stock ranking *pari passu* with the present issue. The stock will be redeemed by a cumulative sinking fund, to be commenced not later than 1935. The prospectus briefly outlines the history and objects of the Board, and states that, subject to the consent of the Electricity Commissioners, the Board can borrow £33,500,000. The Commissioners' sanction has already been received in respect of £13,900,000, of which £5,400,000 relates to standardisation of frequency, and £8,500,000 to the construction and acquisition of main transmission lines and other purposes. The proceeds of the present issue will form part of the sum of £13,900,000. The prospectus quotes figures showing the rapid progress of electricity supply in this country, and mentions the five schemes already adopted by the Board. The list was to be closed on or before Tuesday this week.

Potteries Electric Traction Co., Ltd.

The report for 1928 shows a total revenue of £266,145, as compared with £254,753 in 1927, and a net revenue of £28,618 (including £3,400 brought forward). Debenture and loan interest absorbs £18,636, £5,000 is placed to reserve, and £4,982 is carried forward. The reserve now stands at £133,139, and the renewals fund at £43,539. The arrears of dividend on the 5 per cent. cumulative preference shares now amount to £59,719. In pursuance of the agreement with the Stoke-on-Trent Corporation, omnibuses have been substituted for tramcar services on all tramway routes. The last tramcar services were discontinued on July 11th last. The removal of the overhead equipment, and in some cases tramway track, is proceeding, together with the adaptation of the car sheds and workshops for use with the omnibus undertaking. An abandonment Order has been made by the Minister of Transport in respect of the tramways and light railways, as from March 31st, 1929. Mr F. W. Chanter has resigned from the board, and Mr. W. Thom, who has resigned his position as general manager, Mr. H. Kingsbury, the secretary, and Mr. O. C. Power have been appointed directors.

Kalgoorlie Electric Power and Lighting Corporation, Ltd.

The annual meeting was held on May 23rd. Mr. G. C. Howard (chairman), who presided, said that he gathered from information issued by the Golden Horse-Shoe Mine that this mine in the Kalgoorlie district expected to treat 40,000 tons of residues per month out of their total of 2,500,000 tons. If this programme was carried out, the installation of the necessary plant would take some time, the work would be spread over five years, and a substantial amount of power would be required, which the company would be in a position to supply. During the past few years the policy of the Federal Government in levying high tariffs on machinery imported into Australia had threatened to throttle industry. Recent advices, however, indicated that the Minister controlling tariffs had adopted a more encouraging attitude towards the primary industries. The report and accounts were adopted.

Great Northern Telegraph Co., Ltd., of Denmark.

The directors' report for 1928 states that, apart from improvements of the Trans-Siberian route, its activities in Russia are more or less stagnant, and do not, for the time being, promise to give any positive result. In China the Radio Corporation of America is to erect two wireless stations near Shanghai for the exchange of traffic with Europe and America. When these stations are opened in about 18 months' time, the competition may make itself felt. The accounts show that there was a rise in net revenue from £360,295 to £441,903. The addition of £219,308 brought forward makes available £661,212. The reserve and renewals fund receives £33,333, dividends and bonus (totalling 20 per cent.) absorb £400,000, and directors' fees £3,000, and a balance of £224,823 is carried forward.

Kolster-Brandes, Ltd.

Speaking at the statutory meeting on May 24th, Lt.-Cdr. E. W. Stone (U.S.N.R.), presiding in the absence of the chairman, said that he believed the company had one of the best laid-out and equipped radio factories in Great Britain. To provide for further expansion 20 acres of land had been acquired adjoining the Sidcup works. The parent American company was securing an increasing share of the American radio business, and that success would be reflected in expanded activities for the English company.

Prospectus.

British Filograph Co., Ltd.—On Thursday last week this company, which has a capital of £125,000 in 2s. shares, made an issue of 600,000 shares at par. It has been formed to acquire patent rights in respect of inventions for recording and reproducing sound on a thread. The prospectus stated that the device could be employed for a number of purposes for which gramophone disk records were now employed, and one of the articles to be produced was an adapting device to enable "Filograph" records to be reproduced on the ordinary gramophone. The registered office of the company is at 1, Museum Street, W.C.1. Further details appear in the "New Companies" section of this issue.

Isle of Wight Electric Light and Power Co., Ltd.

The revenue for 1928 was £32,193 (as against £30,087), and after providing for interest, sinking fund, &c., and including £1,035 brought forward, there is a balance of £16,932. It is proposed to place £1,500 to reserve, £500 to staff benevolent fund, and to pay a final dividend of 4 per cent. (making 8 per cent., free of tax, for the year) on the fully-paid and partly-paid ordinary shares issued during the year, leaving £1,032 carried forward.

Eastern Extension, Australasia and China Telegraph Co., Ltd.

The report covering the three months ended March 31st, 1928, shows a gross revenue of £517,779, and after deducting ordinary expenses, &c., there remains £298,734, from which income tax payable in England, and interest on mortgage debenture stock are met, leaving £243,516, to which is added £653,622 brought forward, making £897,138. A dividend of 2½ per cent., free of tax, has been paid, leaving £797,138, which is placed to reserve.

Dundee, Broughty Ferry and District Tramways Co., Ltd.

The profit for the period August 1st, 1927, to December 31st, 1928 (including £495 brought forward) was £2,780. Interest absorbed £1,611, leaving £1,168, which it is proposed to carry forward. A Provisional Order has been presented to Parliament to secure proper joint working of the line from Montifieth to Dundee by the Corporation and the company. Meantime, the directors have been compelled to suspend payment of the dividend on the preference shares, which have received no dividend since October, 1927.

Callender's Cable and Construction Co., Ltd.

The profit for the past year was £360,581, as compared with £357,378 for the preceding year. From this £50,000 is allocated to depreciation, £10,000 to income tax, £13,500 to debenture interest, £5,000 to capital expenses, £10,000 to pension fund, and £56,000 to preference dividends, leaving £216,081. The addition of £474,165 brought forward makes available £690,246. It is proposed to pay a final ordinary dividend of 10 per cent., again making 15 per cent. for the year, and £570,246 is to be carried forward. The report states that the past year was marked by the absence of large cable contracts, but the general business remained steady, and improved materially in many directions. Since the commencement of this year the outlook has distinctly improved, and the volume of business is increasing at both the Erith and the Anchor works. The directors propose to capitalise part of the reserve, and issue it in the form of fully-paid ordinary shares to the ordinary shareholders in the proportion of one new share for each five held. Reference is made to the purchase of the business of W. T. Glover and Co., Ltd., and it is stated that as a decision in the matter had to be taken immediately, the only means of carrying the transaction through was by the sale of sufficient shares in the company to a leading firm of bankers. Meeting: June 6th.

Buell Combustion (Foreign), Ltd.

The first annual meeting of this company was held on May 23rd, Mr. S. H. Menzies (chairman) presiding. In presenting the report and accounts, the chairman said that they had effected a union with the firm of Loy & Aube in respect of the pulverised fuel section of their business, which had resulted in the formation jointly with them of the first subsidiary—Compagnie Française Buell Combustion. The new company represented the combination, in so far as concerned either land or marine pulverised fuel combustion, of the Buell burner and the Rex pulveriser of Messrs. Roy & Aube. Since commencing operations, the prospects of the Compagnie Française Buell Combustion had developed, and it was anticipated that before the close of the year important contracts now offering would be secured. Tentative negotiations were in hand in two other of the most important countries within this company's territory, and in one of these an important trial of the Buell system was about to be made. The report and accounts were adopted.

Eastern Telegraph Co., Ltd.

The revenue for the three months ended March 31st, 1928, amounted to £789,957, from which is deducted £571,710 for ordinary expenses, leaving £218,247. After providing for income tax payable in England, &c., there remains a balance of £149,673, to which is added £525,765 brought forward, making £675,437. A dividend of 2½ per cent., free of tax, has been paid on the ordinary stock, leaving £550,437 to be carried to reserve. The vice-chairman, Mr. J. C. Denison-Pender, has been appointed chairman in succession to the late Sir John Denison-Pender.

Hydro-Thermal Power, Ltd.

In the note regarding the registration of this company which appeared in our issue of May 17th (p. 883), two errors occurred. The name of Brig.-Gen. E. L. Spears, C.B., was incorrectly spelt, and the name given as "Granville (?)" should have been Sir Edward Manville, J.P. These gentlemen and the other subscribers named have signed the memorandum for their qualification shares—2,500 of 2s. each, and constitute the board of the company.

Electric Construction Co., Ltd.

The net profit for the year ended March 31st last was £8,739 (against £20,593 in 1927-28). To this are added £8,043 brought forward and £10,000 from the dividend equalisation fund, making £26,782. A final ordinary dividend at the rate of 5 per cent. per annum is proposed, making 5½ per cent. for the year (against 7½ per cent.).

United Light and Power Co.

An offer was made on May 23rd of $50,000,000 of stock of the United Light and Power Co. This was one of the largest financial issues of this nature of the year. The offer consisted of 500,000 $6 convertible preference shares priced at $100. The company has important holdings in the Middle West, in the South and in Canada.—*Reuter* (New York).

Richard Johnson & Nephew, Ltd.

The profit for the period from May 24th, 1928, to March 31st, 1929, is £37,056. A dividend on the ordinary shares for the period at the rate of 8 per cent. per annum is recommended, leaving £10,835 to be carried forward.

Reduction of Capital.

ELECTRICARS, LTD.—A petition has been presented to the High Court for the confirmation of the reduction of the capital of the company from £138,000 to £18,000, and will be heard in London on June 4th.

Shawinigan Water and Power Co.

A dividend of $0.5 per share has been declared on the common shares for the quarter ending June 30th.

Para Telephone Co., Ltd.

The accounts for 1928 show a net profit of £7,442, as against £6,833 in the previous year. A dividend of 5 per cent. is paid, and £5,296 is set aside for depreciation, &c., leaving £1,963 to be carried forward.

Consolidated Gas, Electric Light and Power of Baltimore.

A dividend of $0.75 per share has been declared on the common shares for the quarter ending June 30th.

Burma Electric Supply Co., Ltd.

An interim dividend of 2½ per cent., less tax, has been declared on the ordinary shares.

Stocks and Shares.

MONDAY EVENING.

THE quietude imposed upon Stock Exchange business by politics, in advance of the General Election, became accentuated by a further flurry in the money market, on account of a somewhat threatening state of affairs that developed in American financial circles. Money in New York and in other American cities has been for some time past growing dearer Pressure continues to be brought to bear upon the general situation by American authorities bent upon putting an end to the over-speculation in stocks and shares which, they contend, is having a serious effect upon the trade of the country. The position became acute at the end of last week, when there seemed to be a fair prospect of the Bank of England having to raise the stiff rate of 5½ per cent. that came into operation on February 7th last. A 6 or 6½ per cent. Bank Rate is about the last thing that people who are interested in financial matters on this side desire to see. It would lead, inevitably, to curtailment of Stock Exchange business, and to a general reduction in prices. A downward movement started some few days ago, when prices of gilt-edged securities were depressed, and the quotations for industrials came under the influence of a wave of weakness caused by a good deal of actual selling. The electrical supply shares which have been recently so popular yielded a certain amount of ground, though the depression in these turned out to be less than that which affected a good many other sections. As soon as the Election is over, and, in popular phrase, we know where we are, business conditions are likely to settle down into a more normal state. When the suspense is removed, it does not seem unreasonable to look for a recovery in prices, provided that the monetary influences which govern the Bank Rates in this country and in America become more elastic.

Falls in Eastern Cables.

Eastern Telegraph ordinary stock has shed 5 points, and the prices of Eastern Extensions and Western Telegraph shares have given way. This is in accordance with the usual Stock Exchange tradition which looks for reaction in prices as soon as any event materialises upon which attention has been focused for a long time previously, and upon the strength of which a considerable rise has occurred. Publication of the full details of the plan put forward by Wireless & Cables, Ltd., leaves little more to imagination. Therefore the speculative prospects which have attached hitherto to the stocks are replaced by other considerations. These latter, affected as they are by money, had the effect of bringing in sellers, with the results already mentioned. Moreover, as was pointed out here last week, holders are a little disappointed by the statement that those who exchange their interests into the new Corporation will receive no dividend upon their ordinary shares until some time after June, 1930. Other cable stocks and shares are quiet. Great Northern Telegraphs went a little easier on a report which shows the net profits for the year to be down by some £52,000, although the dividend is maintained at 20 per cent. This has been rendered possible by crediting to revenue account £133,333, transferred from accrued interest on the reserve fund. The report states that so far as the Great Northern Telegraph is concerned, the directors feel there is no reason to think that the fusions amongst wireless and cable companies will have any adverse influence on the friendly relations which now exist between the Great Northern and other cable companies.

Wireless Weaken.

Marconis have given way to £4, which is, of course, ex dividend, the £1 shares at 4⅛ and the preference at 4¼ also being easier, for much the same reasons as those which account for the heaviness in the Eastern Cable group. Curiosity is expressed in regard to the likely action of shareholders in the various companies concerned, in connection with the assent to the plan for amalgamation. A 60 per cent. assent is required from holders of the various stocks and shares to which the plan applies. Various rumours are afloat in regard to the total assent that is said to have been received by the Bank of England, but no definite figures have come to hand up to the time this was being written. Canadian Mar-

conis remain dull at 1¼, and Burndepts at 4s. 7½d. International Telephone and Telegraph capital stock at 250 is 16 points down. American Telephone and Telegraph at 215 has fallen five points.

Central Electricity Board Issue.

The Central Electricity Board is issuing £3,000,000 of 4 per cent. stock at 83, dated 1959-1989. There is a sinking fund attached to the loan for the purposes of redemption. The price of issue looks high, affording, as it does, a flat yield of no more than £4 16s. 5d. per cent. The issue made its appearance at an unfortunate time, for had it come, say, a couple of months earlier, it would have been assured of ready oversubscription. The stock is not issued under the Trades Facilities Acts, as a good many people expected would be the case, nor is it available for investment under strict trusts. The security is regarded, of course, as being first-rate, and the effect of issuing a stock carrying a comparatively low rate of interest, at a considerable discount, is to attach to the price the possibility of advance in value when money becomes cheaper.

Dollar Stocks.

Brazilian Tractions have fallen back 3¼ to 53, and the Anglo-American group is dull as a whole. Hydro-Electrics, in spite of the maiden dividend announced last week, have dropped to 34¼. International Holdings at 7½ are a point lower. Dealings started a few days ago in the "B" shares of the Hydro-Electric. These are 5 per cent. cumulative participating preference shares of $10 each, and the price is about $7½. British Columbia Power "A" and "B" shares are dull at 46¼ and 27½, respectively. A little interest is being taken in Utilities Power and Light Corporation shares, the "A" standing at 42, and the "B" at 48. Neither has a par value. The company controls the ordinary shares of the Greater London and Counties Trust, the company which has lately bulked largely in the public eye through the purchase of various British electricity undertakings. In particulars issued officially by the Utilities Power and Light Corporation, it is stated that the "British companies and their subsidiaries" (owned by the Utilities Power) "serve exclusively 95 cities and towns in England and Scotland with electricity. This 100 per cent. electric service is increasing at double the rate of corresponding American cities and towns."

The American General Electrics are undergoing wild price fluctuations in Wall Street. A rise, one day last week, to 283 was succeeded by a fall of 9 points within the same session of the market. On the same day, Electric Auto-lites touched extremes of 158 and 150.

Electricity Supply Shares.

Newcastle and District Electrics rose to 28s. 9d., and Clyde Valleys to 33s. 9d. Llanelly and District ordinary hardened to 15s., Yorkshire Electrics to 34s. 6d. Other changes in this section are to slightly lower figures. Midland Counties and Urbans show trifling declines. At one time Northamptons dipped to 42s. 6d., but the price rallied to 45s. British Power and Light Corporation remain heavy at 1s. 3d. discount. There are sellers about who, expecting the issue to be very popular, wrote for more shares than they wanted, and, upon getting allotments in full, now find themselves stale stags. Altrincham deferred shares have gained a few pence, at 18s. 3d. Atlas sagged to 26s. 9d. Burma Electric Supply shares remain at about 20s.; the interim dividend payable on June 1st is 2½ per cent., against 3 per cent. a year ago. There are on offer 2,000 Charing Cross City Undertaking 4½ per cent. preference shares of £1 each, obtainable at 17s. 10½d., carrying a dividend due next month. The yield is 5¼ per cent.

Manufacturing and Equipment Shares.

Callenders at 4⅜ are unaffected by the proposal to make a bonus issue of one new share in respect of every five shares now held. This announcement is in accordance with anticipation. The Philips Glow Lamp Co., which recently offered new capital, on bonus terms, to its shareholders, is stated to have in contemplation the erection of a factory in Austria for the supply of wireless apparatus to the Balkan countries. General Electrics are another 1/16 lower, at 53s. 9d., and Associated Electrical Industries, which stood with General Electrics at 55s. this time last week, are back to 51s. 3d. Henley's hardened to 6⅛. British Insulated retain their gain at 3¾. The Electric Furnace Co. declares a profit of £16,000 and dividends of 7 per cent. on its preferred and ordinary shares. Automatic Telephones have gone back to 2 1/16.

Railways and Traction.

Home Railway stocks are heavy. Underground incomes fell 2, to 112, the £1 shares also being easier at 23s. 6d. The London Tramway descriptions have not moved. British Electric Traction deferred ordinary put on 50 points, advancing to 1,050; the preferred ordinary is 1½ better at 1,302. Iron and steel shares attract but scant public attention. At the meeting of the Armstrong, Whitworth Co., the chairman described the competition in shipbuilding as being intense. Vickers keep at 11s.; Babcocks at 64s. 6d. The rubber share market pursues an erratic plane, within which the movements in prices are narrow and uninteresting. Efforts are being made to establish an association for the voluntary restriction of the output of tin.

Share List of Electrical Companies.

Home Electricity Companies.

	Nom.	Approx. Dividend. 1927.	1928.	Price May 27 1929.	Rise or fall	Yield p.c.
	£					
Bournemouth and Poole	1	15	15	65/9	—	4 11 4
Brompton Ordinary	1	8½	8½	26/-	—	5 7 8
Charing Cross Ordinary	1	8½	8½	26/-	—	5 7 8
do. do. 4½% Pref. ...	1	4½	4½	17/6	—	5 2 10
Chelsea	1	8⅞	8⅞	26/6	—	5 5 8
City of London	1	10	10	33/3	—	4 4 6
do. do. 6% Pref.... ...	1	6	6	23/-	—	5 4 4
Clyde Valley	1		8	33/9	+⅛	... ...
County of London	1	7½	10	53/-	—	3 12 9
do. do. 6% Pref.... ...	1	6	6	23/-	—	5 4 4
Edmundson's 7% Pref.	1	7	7	25/-	—	5 12 0
Elec. Supply Corporation	1	11	—	57/6	—	3 16 6
Kensington Ordinary	1	8	8	26/6	—	5 5 8
Lancs. Light and Power	1	7½	7½	29/-	—	5 3 5
London Electric	1	8½	9	27/6	—	5 1 10
Metropolitan	1	9	9	2½	—	3 18 0
do. 4½% Pref.	1	4½	4½	17/6	—	5 2 10
Midland Counties	1	6½	6½	32/6	—6d.	4 0 0
Mid. Elec. Power	1	15	8	1⅞	—	4 5 4
Newcastle on-Tyne Ordinary ...	1	6	6	26/3	—	4 11 5
do. 7% Pref.	1	7	7	26/-	—	5 7 8
Notting Hill 6% Pref.	10	6	6	11	—	5 9 1
North Met. Elec. 6% Pref.	1	6	6	23/-	—	5 4 4
St. James' and Pall Mall	1	8	8	27/6	—	5 1 10
Scottish Power	1	8	8	32/-	—	5 0 0
South London	1	8½	8	26/6	—	5 5 8
Urban Ordinary	1	7	—	42/-	—⅛	... ...
Westminster Ordinary	1	8½	8½	26/-	—	5 7 8
Whitehall Elec. Invst. 7½% Pref. ...	1	7½	7½	24/-	—	6 5 0
Yorkshire Elec.	1	8	8	34/6	+6d.	4 12 9

Home Rails.

Central London Ord. Assented ...	Stock	4	4	72	—	5 11 1
Metropolitan	,	3	3½	61	—	5 14 8
do. District	,,	4	5	76½	—	6 10 9
Underground Electric	£1	5	7	23/6	—6d.	5 19 2
do. do. Income ...	Bonds	6	6	112	—2	5 7 2

Telegraphs and Telephones.

Anglo-Am. Tel. Pref.	Stock	6	6	109½	—	5 17 1
do. Def.	,,	1½	1½	24½	—	6 2 5
Automatic Telephone	1	10	12½	2⅛	—⅛	6 1 1
Eastern Extension	10	10	10	27½	—¾	*3 13 6
Eastern Tel. Ord.	Stock	10	10	273½	—5	*3 13 6
Globe Tel. and T. Ord.	10	10	10	28½	—½	*3 9 0
do. do. Pref.	10	6	6	11⅛	—	5 5 6
Great Northern Tel.	10	20	—	33	—	... ...
Indo-European	25	10	10	50½xd	—	*4 19 0
Marconi	10/-	10	20	4/-	—	... ...
Marconi-Marine	1	12½	15	31	— ⅛	4 16 0
Oriental Telephone Ord.	1	12	12	3⅛	+⅛	... ...
Western Telegraph	10	10	10	27½	—½	3 18 6

Home and Foreign Trams, &c.

Anglo-Arg. Trams First Pref. ...	5	5½	5½	3⅜	—	7 11 8
do. do. 2nd Pref. ...	5	6	6	3½	—	8 0 0
do. do. 5% Deb. ...	Stock	5	5	76½	—	6 10 9
British Electric Traction Def. Ord.	,,	5	5	1050	+50	... ...
do. do. Pref. Ord.	,,	8	8	130½	+1½	6 2 7
Brazil Traction	100	7	8	53	—3½	3 15 6
Brit. Columbia Elec. Rly. Pfd. ...	Stock	5	5	94½	—	5 5 10
London & Sub. Trac. 5% Pref. ...	1	Nil	Nil	1⅜	—	... ...
London United Tram Deb. ...	Stock	4	4	64	—	6 9 1
Mexico Trams, 5% Bonds	—	5	5	72½	—	6 19 10
Mexican Light Common	100	Nil	Nil	7½	—	... ...
do. 7% Pref.	100	7	7	7½	—	9 13 2
do. 1st Bonds	—	5	5	75½	—1	6 12 5
Yorkshire (West Riding)	1	Nil	Nil	5/-	—	... ...

Manufacturing Companies.

		1926.	1927.			
Assoc. Elec. Ord.	1	—	6	51/3xd	—9/9	2 16 9
Babcock & Wilcox	1	13	15	64/6	—	*4 13 0
British Aluminium Ord.	1	10	10	51/3	—	*3 18 9
British Elec. Transformer Pref. ...	1	7	7	13/9	—	9 6 8
British Insulated Ord.	1	15	15	3⅜	—	4 0 0
Brush Ord.	1	10	10	28/9	—	7 8 0
Callenders	1	15	15	4⅜	—	3 9 0
do. 6½% Pref.	1	6½	6½	1⅜	—	5 4 0
Crompton Parkinson Ord.	5/-	—	—	1	—	... ...
do. 8% Pref.	1	—	8	25/-	—	6 8 0
Edison-Swan 1st Pref.	1	7½	7½	25/9	—	7 1 2
do. 5% Deb.	Stock	5	5	86½	—	5 15 7
Electric Construction	1	7½	7½	18/9	—	8 0 0
Enfield Cable Ord.	1	20	20	4½	—	4 14 1
English Electric	1	Nil	Nil	6/3	—	... ...
do. do. Pref.	1	8	Nil	8/3	—	... ...
Gen. Elec. Pref.	1	6½	6½	23/6	—	5 10 8
do. Ord.	1	7½	10	2½	—⅛	3 14 4
Henley...	1	25	25	6⅛	+⅛	4 1 7
do. 4½% Pref.	5	4½	4½	4½	—	5 6 0
India-Rubber	1	Nil	Nil	13/9	—	... ...
Johnson & Phillips	1	12½	10	36/3	—	5 10
Siemens Ord.	1	7½	7½	1⅜	—	5 9 1
Telegraph Construction	12	10	10	94½	—	*4 19 3

* Dividends paid free of Income Tax.

The Chinese Position and Outlook.

The Need for Co-operation.

IN the April issue of *World Trade*, the journal of the International Chamber of Commerce, there appeared an article on "China: from Revolution to Reconstruction," under the pen-name "Celticus Aper." In this the author outlines recent events in China, and deals with the aspirations of the country's leaders. After emphasising the immensity of the Republic and its unlimited wealth, he mentions the part played by foreigners in Chinese trade and industry. A list is given of the foreign establishments in the country in 1927: Japan is predominant, being credited with 4,446 establishments, employing 239,339 persons. Soviet Russia comes second with 964, employing 74,089 people, while Great Britain is third with 714, employing 14,670 people. Next follow the United States, Germany and France, and six other European countries. Except for official mints, arsenals and ancient manufactures of silk and china, these foreigners have under their direction, or control by their capital, nearly all modern industries, silk and cotton mills, glass factories, electrical plants, and many other branches. The Kuomintang has at its head men young and efficient, trained by western methods, and under their *ægis* financial and economic programmes have been drawn up for the reconstruction of China to bring the country up to a higher standard than ever before. The financial programme includes the unification of administration, the reorganisation of the taxation system, and the reduction of the military expenditure. In the economic scheme there are included the improvement of railways, navigation and communications, the encouragement of national industry, and the adoption of a central banking system.

Above all, the Kuomintang aims at the revision of unequal treaties as a prior condition to undertaking economic reconstruction. The author believes that the Nationalist leaders are not unmindful of what China owes to foreigners. He points out that whatever industrial prosperity exists is due to foreigners. The treaty ports and their hinterland are the only zones of prosperity. Foreigners laid down the plans and provided the capital and rolling stock for China's railways. To foreigners China owes her system of administration which enabled her to raise the necessary revenue, and in 1928, when the powers of administration were withdrawn from foreigners the revenues vanished. It is not only with regard to foreigners that the Chinese masses need to change their views. They stand in dire need of education, and so long as they remain undisciplined and so long as their leaders place politics before economics, no government will be powerful enough to carry reconstruction to a successful issue. The men at the head of affairs must realise that they can never by their own unaided efforts and financial resources within the limits of their own territory, create the means of restoring China to economic prosperity. The three fundamental factors of the problem of reconstruction are: Intellectual revolution to prepare industrial revolution; a unified republic with a strong central government; and foreign co-operation.

Foreign collaboration must not be furnished by any single nation. The predominant influence of any one country would, in the opinion of competent Chinese, be a serious menace to the national sovereignty of China, as well as being a danger to the world. A vast effort of international co-operation is essential; any selfish or narrow vision of the future would be fatal alike to China and to the countries willing to contribute to her reconstruction. It has to be remembered that the needs of China are so numerous and varied that no one country alone could satisfy them. When the Government commences its reconstructive works this will become even more true.

The writer urges the foreign Governments to have faith in the Nationalist Government. Their second duty is a duty of information towards their national organisations. Business leaders and the public must be kept informed of the exact needs of China. They must be encouraged to manufacture goods for the Chinese markets; train new men who will carry to China western ways and methods; and encourage bankers to interest themselves in the Far East. Above all, it is necessary that the business interests of the world, the foreign merchants, manufacturers, traders, bankers, shipowners and insurers shall prepare, in co-operation with Chinese business interests, the vast programme of Chinese reconstruction. Working together, they must compile accurate, clear statistics, comparable with the statistics of other countries. They must obtain a clear view of the great public works to be undertaken —railways to be built, ports to be improved, &c.; of the industrial equipment necessary to China for the exploitation of its raw material and the organisation of its economic equipment; they must estimate the amount of capital required and investigate means of providing it, and so forth. The reconstruction of China means prosperity to the nations which have the courage to undertake it, for the industrialisation and modernisation of China must inevitably increase the volume of international trade. In conclusion, the author considers that a very valuable contribution to the solution of the problems can be made by the International Chamber of Commerce by virtue of its constitution, its independence of Government control, and its practical knowledge of international affairs.

Domestic Appliances in Australia.

An American Survey of the Market.

IN a recent issue of *Commerce Reports*, Mr. L. R. Miller, United States Assistant Trade Commissioner at Sydney, made a review of the market for domestic electrical appliances in Australia, the gist of which is reproduced below, each class of appliance being dealt with separately.

Cookers.

Mr. Miller says that a steadily-increasing number of new apartment houses and residences in Australian cities are being equipped with electric cooking stoves, especially in Sydney, where the charge for supply is favourable. Several American and Canadian models are on the market at prices varying from £20 to £44. The manufacture of electric cookers has recently been commenced in the Commonwealth; a leading firm of gas-cooker manufacturers is now making them, using American elements under agreement with one of the large American companies. The import duties are 40 per cent. for foreign and 27½ per cent. for British appliances.

Refrigerators.

An increasing demand for electric refrigerators is reported. This is created by the long, hot summer which coincides with the American (and British) winter, providing a good "off season" market. Last year Australia imported American refrigerators valued at $692,997. Two models are now being made in Australia, but they are said to be not equal in quality and performance to the American patterns. The average domestic plant costs between £80 and £100, but the price is expected to fall with increased sales.

Washing Machines.

Electric washing machines are becoming more and more widely used; practically all the ten types on the market are American, and some of them are purchasable by instalments. The centrifugal drier is preferred to the wringer, and there is a demand for a machine in which the water is electrically heated. Retail prices range from £40 to £50. Business in this line could be developed by placing a competent factory representative in the field to organise a sales force, although a local company might be formed for distribution purposes.

Heaters.

The mildness of the climate renders central heating unnecessary in most buildings, and electric fires are widely used. Many houses and apartments are now built without fireplaces, and in the winter months small electric heaters are depended upon. It is stated that while many of these heaters were formerly imported from England, appliances of local manufacture are gradually supplanting imported articles. Only one American device, a heater of the reflector type, has a fair sale. The local product is well designed and satisfactory in performance, and opportunities for increased sales of American heaters are limited.

Irons.

Electric irons are a necessity in Australian homes, and there is an increasing demand for automatically-regulated patterns which are imported from the United States or Great Britain. The Australian subsidiary of an American company is manufacturing non-automatic irons, and there are several other local factories. Recent importations of German irons have tended to lower the competitive price level.

Fans.

Owing to the exceptionally hot summer which Australia has experienced, stocks of electric fans have been practically exhausted, although the normal demand is only moderate. It is stated that no fans are made in Australia, and it is unlikely that local manufacture will be undertaken. Imports of fans come principally, and in almost equal proportions, from the United States, the United Kingdom, and Italy. The demand is mainly for the oscillating type of fan, there being almost none for the fixed patterns. One American company having an Australian subsidiary has recently notably increased its volume of business by reducing prices and providing service.

Other Appliances.

There is an increasing demand for "oven" type two-slice toasters with three elements, which type is not made locally. Automatic toasters are also popular. Ordinary toasters are made in Australia, and most of the imports are from the United States. Prices range from £1 to £2. The electric tea-kettle is being gradually superseded by the carbon-electrode jug; this is made and patented in Australia, and is said to be used in no other country. The jugs require about six amperes, and should last indefinitely. The electric kettles on the market are of British, American or local manufacture, and retail at from £2 to £3. There is a fair demand for dish-washing machines. These are imported from America, but generally the price is prohibitive. Machines retailing at £15 or less should find a market.

A Control Gear Manufactory.

Some impressions of a recent visit to one of the British Thomson-Houston Co.'s factories at Rugby, which is devoted to the production of industrial electric motor controlling apparatus.

THE contention that the design and manufacture of control gear calls inherently for wider general knowledge and experience of electrical machines and their applications in industry than any other branch of electrical engineering will be readily acknowledged if one contemplates the onerous functions which such gear has to perform. Not only has it to control and protect an electric motor, generator, or transformer, as the case may be, but it must also essentially protect the operator and protect and control the plant with which it is used. It is accordingly quite evident that only by years of intimate contact with, and experience of, the many problems associated with these three essentials can sound principles and practice be established.

Fig. 1.—Control Gear Factory of the British Thomson-Houston Co., Ltd., Rugby.

It is interesting to recall that the British Thomson-Houston Co., Ltd., published its first price list of Rugby-built motor starters in 1902, and supplied the first contactor equipments to the London Underground Railways in the same year. The Company claims also to be a pioneer in the introduction of contactors for industrial applications, and installed the first equipment of this kind at the works of Messrs. Scott's Shipbuilding and Engineering Company at Greenock in 1910.

The frequent application of electricity to fresh uses and the improved machinery which is continually being made available to other branches of engineering as a result of such application, daily creates new requirements that necessitate the employment of a considerable staff of engineers and draughtsmen, as fig. 2 indicates; it is a view of a section of the drawing office, the whole of which is devoted entirely to control gear. The engineering staff is accommodated in a separate office and each individual specialises in some particular branch of design or industrial application, such as d.c. starters, a.c. starters, resistances, contactor gear, pillar-type starters, controllers, automatic sub-stations, traction, ship propulsion, colliery winders, rolling mills, &c. Switchgear of the generating-station type is not handled at Rugby, being the product of an entirely separate factory at Willesden, on the outskirts of London.

The building shown in fig. 1 is a part of the main works at Rugby, and is entirely devoted to control gear. The tinsmiths, press shop, foundry, and the sections dealing with resistances, insulation, and coil winding are situated in other buildings. In the factory illustrated the machine shop occupies the whole of the second floor, with an area of 22,500 sq. ft. It is thus situated between the two floors on which the majority of the assembly work is done, the component parts of the smaller apparatus being sent up to the top floor, while parts for the larger types of apparatus go down to the first and ground floors. The ground floor is used for the assembly of contactor panels, automatic sub-station panels, transformer tap-changing "on load" devices, and ship-propulsion equipment. In the foreground of fig. 3 can be seen a number of panels for a paper mill in course of construction and testing; also a flame-proof oil-immersed reversing contactor. On this floor are special tools for the edgewise bending, drilling, forming, cutting, and sweating of bus-bars, which up-to-date equipment enables heavy con-

Fig. 2.—Section of Drawing Office for Motor Control Gear at Rugby.

Fig. 3.—View of the Panel Assembly Section.

nections to be made neatly and with few joints. The first floor is devoted to smaller contactor panels and to traction equipment, &c., and on the second floor is the machine shop which affords plain evidence of keen management and organisation. Interesting devices and machines have been developed for the quantity production of the many peculiarly-shaped parts which are common to control gear. This floor has been laid out with a view to keeping the material flowing continually in one direction; raw material enters by a lift at the north end, and the finished part is finally delivered to the Inspection Department at the south end, where a second lift carries it to the assembly sections, on which floors the material flows in the reverse direction, *i.e.*, south to north, thus resulting in a uni-directional flow throughout the building.

Fig. 4.—Machine Shop, Lathe and Turret Section.

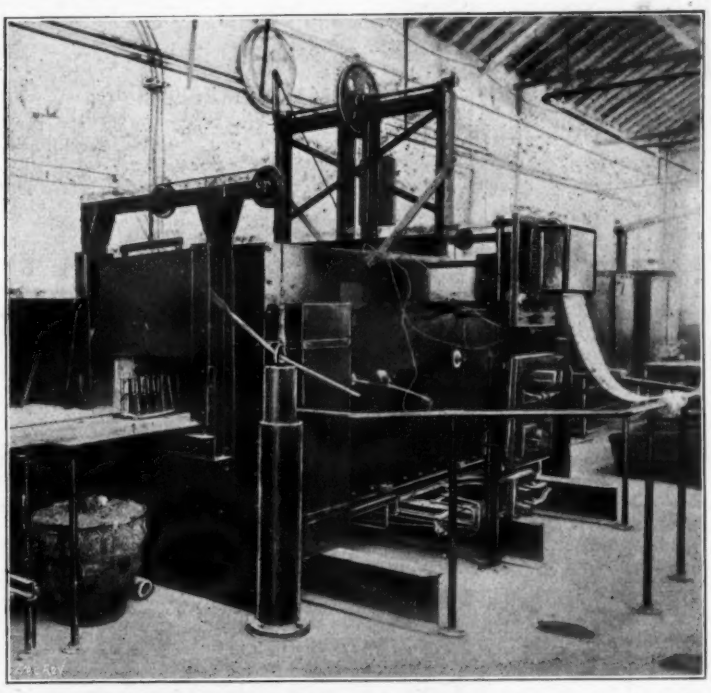


Fig. 5.—Electrically-heated Oven, with Automatic Temperature Control.

The turret lathes and multi-spindle drilling sections are shown in figs. 4 and 6, respectively. The simultaneous drilling of several holes in tramcar controller cap-plates is illustrated in fig. 8; the jig bears runners and tennons fitting into the table-slots and, when loaded, the operator pushes it straight back to a stop, which ensures the location being correct for the drills to enter the bushes. Another application of this machine is of special interest; two sets of tools are set up, so that the holes are first drilled with one set and the jig is then reversed and the holes are reamered with the second set, the spindles being so disposed that when the drills are cutting, the reamers pass clear of the jig, and *vice versa*.

Special milling fixtures and multiple cutters are used whenever possible; for example, the first milling operation on cast-iron magnet frames of railway contactors is a gang one, and half of the external machining is done thus; the casting is then reversed, and a further gang of cutters completes the job. For the milling of operating arms for railway contactors on an automatic machine, the index table method is employed. The operating arms are of malleable cast iron and the six bosses have to be machined outside, and the pairs at each end are machined inside as well; the arbor carries a gang of cutters to machine two castings side by side, and by using the index table no time is wasted, as the operator loads one jig while the cutters are working on the other one. The machine table is automatically controlled by dogs, so that the operator has only to raise the starting lever each time, the motion of the table being quick forward, feed, quick return, and stop. This particular operation has one or two special features. For instance, it is impossible, due to the shape of the centre of the casting, to machine right through at one operation, and the jigs have been so designed that four bosses are machined outside and one pair inside in a jig at one end of the table, the remaining pair of bosses being machined inside and out in a jig at the opposite end of the table, the two jigs being so aligned that the two operations are "complementary" to one another. This arrangement makes it possible to use the index table with only one jig of each kind, instead of a pair of each as is the usual prac-

Fig. 6.—Machine Shop, Multiple-spindle Drilling Section.

tice, so that each casting only pays one visit to the machine before being finished. If two pairs of jigs were used, it would mean machining one end of all the castings first and then going over them all again to machine the second end. Owing to the fact that the plunger which bears against the work as the drill descends and engages with the work, and thereafter further downward movement of the drill is taken up by the spring in the barrel. The machine is foot operated, so that the operator has both hands free, and uses her right hand to insert the work and her left hand to operate an ejector lever. This method of drilling such parts is exceedingly rapid and has also been applied in cases of two-spindle work.

Fig. 7.—View showing Assembly of Controllers, Hand- and Pillar-type Starters.

A very large variety of drum-controller segments has to be drilled, and a machine has been designed in the controller factory to accommodate all these parts. The two spindles can be set at any angle between 18 and 180 degrees, the angle being plainly marked on a sector on which they are mounted. Adaptors of various sizes can be inserted at the centre of the circle to accommodate segments of varying widths and diameters, the segments being mounted on their respective adaptors by means of two arms, which are also set to a scale of degrees. The drive is taken from the motor by a belt passing over two pulleys, and is transmitted to the spindles through two pairs of mitre wheels. A combined drill and counter-sinking tool is used, so that only one operation is necessary to drill and counter-sink both holes in their correct positions. The large cutters pass the outside of the end bosses before the small cutters reach there, springing took place. To overcome it, the large cutters were made with large-diameter bosses slightly greater in diameter than the small cutters. These bosses reach the outside and the bosses which have already been machined before the small cutters start to cut on the interior, and so hold the whole job perfectly steady. Production for the complete cycle of two operations is about 30 per hour with gird operator.

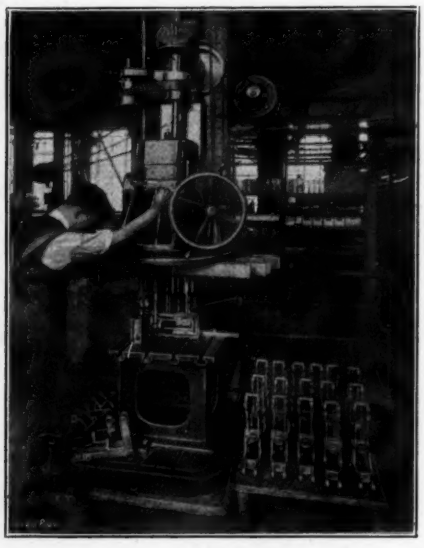


Fig. 8.—Multi-spindle Drill and Reamer.

Fig. 9.—Winding and Assembling " Unbreakable " Resistances.

An interesting special device is used for the rapid drilling of parts in which is a single hole, such as contactor tips. The main principle is that the downward movement of the spindle as the drill approaches the work is used to clamp the work in position. The general housing is common to a number of parts, interchangeable blocks being inserted for each separate article. The barrel attached to the spindle contains a spring plunger to which are pinned two pairs of links that are pivoted on the top of the fixture; on the links is an adjustable block carrying a further spring

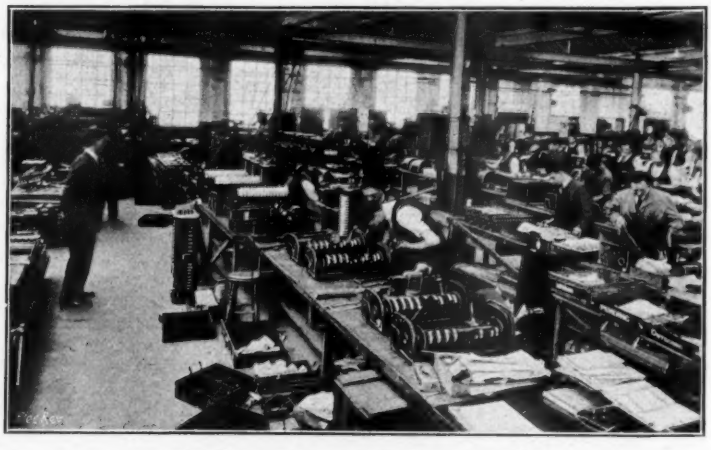


Fig. 10.—Drum Controller Assembly.

top floor of the factory, a general idea of which can be obtained from fig. 7, is devoted to the assembly of controllers, hand starters, and pillar-type starters, and the winding of resistance tubes. Vitreous-enamelled units are wound on porcelain tubes and then enamelled in an electrically-heated oven, fig. 5, the temperature of which is automatically kept within certain predetermined limits and is continuously recorded on a chart by a Leeds & Northrup recorder, seen on the right in the illustration. This plant is capable of baking 9,000 resistance tubes per week. The units are enamelled at red heat, and on completion will, it is claimed, withstand over-loading to a similar temperature for comparatively long periods without permanent injury. As the wire is coated with a thick glaze, it is impervious to moisture, and appears to be a good form of construction for high-resistance units. Fig. 10 is a view of a section of this floor that is devoted to the assembly of drum-type starters.

An important product of this floor is pillar-type starters for both a.c. and d.c., and the faceplate as well as the drum-type are manufactured: d.c. pillars, comprising a drum-type starter with a step-by-step ratchet motion are supplied up to 1,200 amperes capacity; a.c. pillars, equipped with similar drum-type starters for rotor circuits and triple-pole contactors with overload relays in the stator circuits are supplied up to 500 amperes per phase.

Owing to the greater quantities required, d.c. faceplate starters necessitate special handling by the straight assembly line method, starting with the switch base at one end and finishing with the complete starter at the other. The number of operations to be performed by each worker is planned to occupy the same time, so that there should not be any accumulation of work between the operators. The necessary parts required by each operator are stored in suitable receptacles, so that they are handy to the operator with a minimum effort. At the end of the line the complete starter is tested and is ready for packing and dispatch.

Cast-grid and "unbreakable" resistances for crane controllers, trolley 'buses, tramcars, traction, neutral earthing, &c., are made in a separate building. Machines for producing and assembling the "unbreakable" resistances are shown in fig. 9; they are completed by fitting terminals and assembling in frames, final testing taking place in the enclosure seen in the background. The "unbreakable" resistance is composed of a continuous wire formed into grids on the machines seen in the background of fig. 9. The wire strip comes into the works in a continuous coil: it is first cleaned and then electro-plated to render it proof against corrosion; then it is fed to the grid-forming machine, from which it emerges as a continuous series of grids, which are coiled directly on to drums seen in the foreground of fig. 9. The next operation is that of building the grids into resistance banks, mounting them on mica-insulated tie rods with the necessary spacing and insulating washers, and then passing the product to the section in which the terminals and covers are fitted. If necessary, a number of boxes are bolted together to form a complete unit. They are finally tested for checking their resistance values and also their insulation values.

Obtaining Consumers in Rural Areas.

An outline of the propaganda that can be carried on by the E.D.A. and individual undertakings, and the salesmanship required to convert prospective clients into consumers.

By LT.-COL. W. A. VIGNOLES, M.I.E.E.

(Abstract of a Paper read before the OVERHEAD LINES ASSOCIATION.)

THE economic supply of electricity from public mains depends largely on the demand in the area to be supplied, and an indication of the possible demand is the density of the population. We may get a glimpse of the nature of the problem if we consider that 78 per cent. of the population lives in cities, towns, or urban districts, which only occupy 7.7 per cent. of the area of Great Britain, the remaining 22 per cent. of the population occupying 92.3 per cent. (this figure is reduced to 57 per cent. if we exclude woods and forests, deer forests, mountains and heathlands) of the area of the country; in other words, the average density of population in the towns is nearly 5,000 per square mile, while in rural districts it averages only 115 per square mile.

The problem is, however, not only one of density of population; it is in fact very complex, no two areas presenting exactly the same conditions. It is possible, however, to classify areas into at least three broad types: (1) villages, or districts, suburban in character, where the majority of the male population works in the town and earns wages on the town scale; (2) villages where the bulk of the population works on the land, and (3) rural areas with isolated farms and cottages. The first class of districts should respond well to propaganda and sales efforts, as the inhabitants will appreciate town amenities and will be anxious to secure them in their homes. The demand for electricity should be good, and the revenue be sufficient to make the supply of electricity a paying proposition. The second and third classes are definitely "rural areas."

The supply of electricity in rural areas has the advantage, as compared with supply in towns, that usually there is no competition from gas, while, owing to the cost of transport, coal is usually more expensive than in towns. Apart from coal our sole competitor is usually oil, used for lighting and to a considerable extent nowadays for cooking, but electricity for lighting at 9d. per kWh is as cheap as oil, while electricity at 1½d. is as cheap for cooking as coal at 50s. per ton, and in most cases cheaper than oil, while the use of electricity reduces labour, promotes cleanliness, and is altogether more convenient.

In towns it is possible to sell electricity at prices above the cost of competitive methods, as the greater convenience and the reduction in labour frequently represents a definite money value to the town dweller. In rural areas, among those with the smaller incomes, this is by no means the case; the rural dweller frequently does not spend money to meet his needs, but makes his needs match his pocket, while labour-saving devices make no appeal whatever. Even so, however, a cottager may easily spend 1s. per week on oil for lighting and 2s. 6d. per week for coal; that figure for lighting, while small, approaches the amount used in some small houses in towns.

In any kind of country the principal factor in obtaining success will be to secure the large houses, or farms, as consumers; if they can be obtained, it will be possible as a rule to supply the smaller premises in their vicinity.

I must not omit to remind you of the traditional nature of the rural dweller, slow of speech, and slow to make up his mind; such a man, or woman, will require much talk and persuasion before he, or she, will venture on a new piece of business. We must remember that he, or she, may never have purchased gas, or water, and that to buy electricity from a public undertaking is a great event.

Our problem of obtaining consumers in rural areas is really two-fold: (1) To create in the mind of the probable consumer the desire to use electricity, and (2) to convince him that he can afford to buy it. The ways in which we can tackle these problems can be divided broadly into (*a*) national propaganda, such as is carried out by the E.D.A.; (*b*) local propaganda; and (*c*) personal salesmanship. It will be an advantage to include urban as well as rural districts, as while the propaganda and sales efforts may have to be varied in the rural distfricts the greater return obtained in the urban areas will enable a more complete organisation to be developed. The first stage should be the circulation of propaganda in the area to be developed, before any decision to bring a supply into the district is announced. This can be linked with the work that the E.D.A. is doing, and should be followed by a series of lectures to women's institutes and other organisations. Such propaganda

and lectures, it has been suggested to me, is best carried out by an organisation other than the undertaking which is actually going to sell the electricity (the cautious rural dweller looking with suspicion at anyone trying to sell him something), and the E.D.A. will very willingly carry it out when desired. Finally, there should be public meetings in the area, it being explained that unless sufficient support is forthcoming it will not be possible to supply the area. At such meetings all questions of cost should be discussed, answers given to would-be consumers, and efforts made to obtain actual signatures to supply agreements. It is desirable to secure the attendance of some prominent local man as chairman, while the attendance of the chairman of the electricity committee concerned, or a director of the company, as the case may be, will be appreciated. It will be found helpful to state clearly in the first instance the number of consumers required to enable the scheme to proceed; from time to time the number of signatures can be stated and, if properly worked, it will be found that the inhabitants of the area who want a supply will themselves assist to obtain the necessary signatures. As part of the propaganda in the early stages, small exhibitions of apparatus and kinema displays should be arranged in various suitable centres. Travelling exhibits arranged on lorries are useful, with a small petrol-driven set to supply the electricity required for the projector and for demonstrating small apparatus when exhibiting in districts where public supplies are not available.

When the necessary number of consumers has been obtained and the scheme is proceeded with, there will still remain a great deal of "selling" to be done. An undertaking that is well established should spend not less than one per cent. of its revenue on publicity and propaganda. An undertaking developing a new area would have to spend more than that as the revenue might be very small. In such a case the amount to be expended should be based on the revenue anticipated at the end of, say, six years. Perhaps I may say in passing that out of that amount of one per cent. my Association asks that one-tenth should be handed to it as subscription, to be expended on behalf of the undertakings on national propaganda. In other words, undertakings are asked to contribute £1 per £1,000 of their revenue towards a national propaganda scheme on which about £35,000 per annum is being expended.

Whatever scheme is adopted, each undertaking should have an adequately paid man in charge of the sales, with sufficient assistance and necessary transport facilities to cover the area.

Table I indicates the detailed scheme of expenditure on propaganda of an undertaking covering a rural and urban area, the total expenditure proposed being £1,000 per annum. It would be necessary to consider the character of an area before settling the exact allocation of expenditure between the various items.

Table I.

Item.	Expenditure per annum.
Local newspaper and parish magazine advertising ...	£200
Poster publicity on permanent boards (see E.D.A. booklet "Say it with Posters")	100
Booklets and literature for distribution	75
Direct mail	75
Travelling van with kinema and display of apparatus, hired, for a portion of the year	150
Exhibitions, allowance per annum; a portion might be accumulated and spent every few years on a large exhibition	200
Lectures, entertainments and film displays	100
Subscription to E.D.A., say, one-tenth of 1 per cent. of revenue	100
Total	£1,000

Travelling vans would cost a substantial amount, fitted ready for use, and must be adequately staffed, but it is thought that undertakings might be glad to have one for a part of the year and if there was sufficient demand for such a van the Council of the E.D.A. would be willing to provide one.

It is probable that selling efforts will be even more necessary in rural areas than in urban ones, owing to the lack of knowledge of the rural dweller. A good salesman suited to this particular work will be invaluable, but how is he to be found? Let us select a man for training who has some knowledge of country life; or, if he has no such knowledge, let us set about remedying the omission. A man who can discuss the crops and the seasons with the farmer, who can stay to tea and can keep his end up in the general conversation, who can handle a gun and join the farmer in a little shoot, will, if he knows the remainder of his job, go a long way. On the domestic side women demonstrators will be helpful, especially if they also understand country folk and can give an acceptable talk at a Women's Institute. These institutes are likely to be extremely valuable in the future. It is undesirable, however, that lectures should be given until there is some prospect of a supply being taken to the district.

The tariff and the provision of hire and hire-purchase facilities will have a great effect on the business done, and I hope all undertakings will introduce a two-part tariff with a charge per kWh not exceeding one penny; all undertakings should provide hire facilities.

What business is one likely to obtain in rural areas? The report of the Electricity Commissioners' Conference on Electricity Supply in Rural Areas indicates potential loads of the order indicated in Table II.

Table II.

Type of farms.	Yearly consumption, kWh. Farm house.	Farm power.	Total.
A. Arable and stock farm, 300 acres (with threshing)	7,000	1,800	8,800
B. Arable and stock farm, 100-150 acres (without threshing) ...	3,000	1,000	4,000
C. Large dairy farm, 300 acres (with milking plant)	7,000	7,000	14,000
D. Medium dairy farm, 100 acres (with milking plant)	3,000	2,600	5,600

Appendix 6 to the report of Sub-Committee No. 1 shows that 1,007 farms in rural districts in Great Britain in 1927 used on the average 1,400 kWh each. Appendix 9 shows the consumption on a 300-acre dairy farm with 300 cows to be as follows:—

Dairy use	7,700	kWh per annum
Lighting	500	,, ,,
Farmhouse, cooking, heating, washing, machinery, &c. ...	7,000	,, ,,
Lighting cottages	200	,, ,,
	15,400	,, ,,

I am inclined to think that we might estimate that where gas is not available we should, at 1d. per kWh, plus a fixed charge, or on a prepayment meter, be able to secure a revenue of, say, £2 per annum from the smallest cottages, and of from £5 to £10 per annum from a normal farm, while supply to large farms and houses may run into very large figures.

I have recently received information from the U.S.A. about progress with rural electrification in that country. At a conference held there recently it was stated that in many cases it had been shown that electricity supply "cost nothing at all"; in other words, by using electricity the farmer had increased his net earnings by more than the cost of the electricity.

In this country, as in the U.S.A., there appears to be ample evidence that at anything like a reasonable price electricity can be shown to be a paying proposition for the farmer, at least to those engaged in dairy and poultry work. I want to enthuse my hearers with some of my confidence in the future of rural electrification. However, I do not want it to be assumed that I think every case must, of necessity, be profitable.

In the important question of rural industries there are enormous possibilities. With the aid of electricity the village craftsman and worker should be able to compete against the town.

Discussion.

Mr. G. F. Morris (Farmers' Union) said that three years ago he agreed to poles being placed on his land for the purpose of a public supply of electricity, on the understanding that he would receive a supply himself; but, although he was suffering the inconvenience and loss occasioned by the presence of the poles, he had not yet been given a supply, neither had he received any compensation in any shape or form for the poles being placed on his property. That was hardly the way to encourage the development of electricity supply in the countryside. It was necessary to prove to the farmer that if he was to sacrifice his internal-combustion engine, it was going to be replaced by something which was at least as good, if not better; but from figures which the Farmers Union had collected they were not yet convinced that a public supply of electricity would be cheaper than the power provided by the internal-combustion engine. Further, farmers and those in rural areas would be much more quickly convinced of the advantages of electricity by practical examples of what could be done and a little less propaganda. Moreover, too much reliance must not be placed upon the immediate return from any particular area; rather should the matter be looked at from the possible ultimate position. Therefore, electricity must be cheap at the very beginning, so that power on farms would be at any rate not more costly than that at present obtained from internal-combustion engines.

Mr. Andrew McDowall said he had always regarded the greatest use of electricity on the farm as being for ploughing, and in that connection the price was all important. At present in the Lothians power was charged for at 2½d. per kWh, and at that charge a day's threshing cost 16s., as against 9s. or 12s. with a paraffin-oil engine. Farmers were asked to scrap oil engines costing £150, and of which the second-hand value was probably £30, and then to spend another £100 on electrical equipment which cost more to run than the original oil-engine equipment. When he first approached the Lothians Electric Power Co. for a supply he was told it would cost £1,600 to bring it to his farm, and the matter was allowed to drop for some years. Subsequently he collaborated with some other farmers, and by providing the power company with all the necessary unskilled labour for putting up the poles, &c., and giving wayleaves free of charge (so long as the power lines were kept to the fences) he was able to get the line laid at a cost, to him, of only £35. It was only by working on that basis that economical distribution could be ensured. At the moment arable farming was an absolutely hopeless proposition, and it was only by obtaining cheaper tillage by the use of very cheap electricity for ploughing that arable farming could be maintained. Electrical engineers as a rule knew nothing whatever about tillage, however, and

that was the difficulty. At the moment he was building his second tractor, but he had only been able to do it with the assistance of the General Electric Co., Ltd., and W. T. Henley's Telegraph Works, Ltd. Those two companies had considerably assisted in building an experimental tractor for electric ploughing, which he regarded as the real sort of propaganda that was essential. It was no use talking about what electric ploughing could do; farmers would only believe it when they saw it, and he suggested to the electrical industry that the biggest market for electricity on farms was in arable farming. As to the low-voltage lines the farmer required, he had been able to use timber cut in the district with the assistance of the people owning the "Cobra" system of impregnation, and in that way had been able to erect very cheap overhead construction, using green local poles.

Mr. R. BORLASE MATTHEWS, who said he shared the author's confidence in the future, objected to the suggestion that two-part tariffs would be used; he preferred multi-part tariffs because of the need for providing for water heating at times when other loads were not on. He would also like to see a tariff based on a standing charge per acre of arable land, say, 2s. 6d., plus 1d. per kWh. In addition to the various suggestions of the author for publicity, good use could be made of monthly propaganda magazines. One of the serious troubles of farmers was to find capital to purchase electrical machinery, but the farmer was in a more favourable position than the average person inasmuch as he could borrow on very reasonable terms from the Agricultural Credit Corporation, or from other organisations, such as the Land Improvement Scheme, on the basis of 15 years' purchase at about 7½ per cent. per annum, whereas ordinary hire purchase amounted to a great deal more, although people often did not appreciate that fact. Another difficulty was linking up high-speed motors with low-speed farm machinery, and speed-reduction gear that was simple and cheap was required. It was also necessary to get back to the individual drive, because experience showed that where portable motors had been used on farms they were being given up in favour of an individual motor connected to each machine, owing to the saving in time and labourers' wages. Comparison should not be made between the actual cost of fuel of an oil engine and the cost of electricity; there was also the time taken in starting an oil engine on a cold winter's morning to be taken into account, together with the cost of lubrication, depreciation, maintenance, &c. He was convinced that the oil engine on the farm would disappear as surely as it had gone from the town. He was pleased to hear what Mr. McDowall had said with regard to electric ploughing; the Royal Agricultural Society was proposing to arrange for some tractor trials on a scientific basis in the autumn of next year, when he hoped Mr. McDowall's tractor would be seen, together with other electric ploughs. Electric ploughing involved the use of about 30 kWh per acre, which indicated the possible demand from the supply authority. An acre could be ploughed for a current cost of 2s. 6d., against 25s. for the ordinary horse plough, so that there was ample margin for depreciation, capital cost, &c. Moreover, farmers who had had experience of electric ploughing were enthusiastic about the better crops that could be grown, owing to the greater uniformity of the ploughing.

Major T. RICH remarked that in looking at the activities of the E.D.A. it seemed to him that they started at the wrong end. There was too much propaganda and advertisement, instead of taking up a particular matter in a practical way and showing what could be done. Why was it not made clear also that one of the reasons why electric lighting was not developing in the manner it should was that electric lamps cost 1s. 11d. in this country, whereas in America, where the labour cost was greater, lamps could be bought for 1s. In France 21,000 villages and small towns were served with electricity, and that had been done without covering the place with posters, &c. It had all been done by the electrical engineer, the farmer, the Department Genie Rurale, and the farming co-operative societies. That type of development, however, could never take place in this country under present conditions. If a supply authority wanted to erect a transformer kiosk on some village green it meant months of correspondence, and all sorts of people talked about spoiling the countryside. As regarded what Mr. Borlase Matthews had said about individual motors, he did not think it was advisable to talk too much at the early stage of a separate motor for each machine. The portable motor was an extremely useful thing, and there was one company on the Continent which made nothing but electrical apparatus for farms. It had made 15,000 portable farm motors, and at the last Agricultural Machinery Exhibition in Paris there were about 15 makes of portable motor for farms. The electric ploughing problem was a very different one in this country, compared with other countries. In this country there were tiny farms, whereas on the Continent big rolling lands lent themselves to electric ploughing much more effectively and economically. There need be no difficulty with regard to reduction gears, as there were plenty that had been found satisfactory abroad, where he had also seen a little motor which could be carried about and set up on a tripod and applied to any particular operation. One firm had made 4,500 of them for French farmers. At the Ideal Home Exhibition there were wooden washing machines which, alone, cost £7, but when a small motor was added the charge was £24, and their makers could not understand why people would not buy them. In France there were 20, or more, makes of cheap electric washers, none of which cost more than £14, and they were made of copper. It was absurd to expect the ordinary working man to pay £30 or £40 for all kinds of gadgets. It was for those reasons that he contended there was too much poster, too little effort, and too little genuine manufacturing.

Mr. W. FENNELL, president, who proposed a hearty vote of thanks to the author, said there could be no complaint of the liveliness of the discussion, but he would pay the author the compliment of devoting his attention to the paper. As regarded future development in districts bordering on towns, he looked forward to "ribbon" building, *i.e.*, houses built alongside the main roads and not clustered in districts as at present, and electric supply must be laid out with an eye to that development. Cities, as they knew them, would begin to decay, a process, indeed, that had already started. As a matter of fact, he was designing his system with that end in view, taking high-pressure mains right through to the consumers. From that point of view it would seem possible that Col. Vignoles had been looking backward rather than forward. It would be interesting to know if there had been any tests of electric cooking with electricity at 1½d. per kWh, compared with oil stoves. Undoubtedly one of the best advertisements for electricity was electricity, *i.e.*, the satisfied user was a centre for beneficent contagion. He had found a stall at the local agricultural show to give good results, but the suggestion to advertise on sub-stations by posters was open to objection in the country by the Society for Rural Preservation. One system for dealing with the cottager adopted for the past ten years in his area was to install two lamps in small cottages for an all-in charge of 1s. per week, without any meters, and that had gone very well.

Miss B. SWIRE, as one who had to try and sell apparatus, said there was little doubt that the public was enthusiastic for electricity, but the cost of such apparatus as washing machines was much too high to be within the means of the ordinary householder. She advocated such local exhibitions as that held last year at Aylesbury.

The PRESIDENT expressed appreciation of the suggestion made in the paper that the Council of the E.D.A. would provide a travelling van, if there was a demand. Engineers must see to it that there was a demand.

Mr. W. A. TURNBULL (Aylesbury) said that the ordinary type of propaganda did not go very well when dealing with rural districts, and he suggested having stalls in the local market place on market days as a very useful method of attracting the notice of the rural population. He claimed that at Aylesbury he had been able to show that it was possible to make a success of rural electrification, although in doing that he had had some assistance from the Government. He was getting 2½ per cent. of his interest paid, but that was on condition that he used unemployed miners and also British cable. The latter meant an increase of 50 per cent. over the price paid for foreign cable, and therefore it became questionable whether there was any advantage in having Government assistance in that matter. He looked forward to considerable development in the use of electricity for poultry farming.

Mr. W. NAPIER PRENTICE suggested that the workpeople employed by the supply companies should be encouraged to become shareholders, a principle that could also be applied to the consumers. That was good propaganda, because, being shareholders, those people advocated the use of electricity among their friends, and so helped the undertaking along. The establishment of district committees consisting of local inhabitants to assist the supply authority was another method which had been found to have useful results.

Mr. F. M. LONG (Norwich) suggested that it was not advisable to do a lot of canvassing before the supply was available in any particular district, because people became disheartened when a supply was talked about a long time before it became available. His experience was that as soon as a supply was available in a village, the consumers came along quite rapidly. He also made it a point to get on friendly terms with members of parish councils, and to hold exhibitions, &c., locally, all of which made things easier. There was no difficulty in getting lighting into a village, but he regarded that as only a beginning. It would never pay to carry a line any distance for lighting only, and efforts must be made to develop the cooking and heating load and also water heating. General national propaganda was very useful, and the work done by the E.D.A. in that connection was extremely valuable.

Mr. J. N. PERKS expressed his dislike for advertising in local papers and preferred the direct mail method. Therefore, he suggested that the sums proposed to be spent on those two items by the author should be reversed.

Lt.-Col. VIGNOLES, replying to the discussion, referred specially to Major Rich's comments that there was too much "eye-wash" and propaganda about the E.D.A., and not enough work. However, Major Rich had asked that the E.D.A. should assist in obtaining wayleaves for the supply authorities, which meant propaganda. As a matter of fact, the E.D.A. had done a great deal to obtain wayleaves by showing the farmers the advantages of electricity supply and allowing lines to cross their property. A great deal in the same direction had also been done by appropriate Press articles. Major Rich had given a great deal of useful information about what was being done on the Continent, but his experience was that people in this country did not take much notice of what was being done elsewhere. They could not impress the English farmer by telling him what was being done in France. It was necessary to prove to him that electricity would help him in the

problem of making his farm pay, and that was the salesman's problem. The E.D.A. could induce that frame of mind by national propaganda and make people talk about things, but the final work must be done by the salesman. The suggestion of Mr. Napier Prentice to make consumers shareholders was a method which was practised very largely in the United States and had been very effective, as a matter of fact, as a method of countering municipal control of electricity supply there.

Rural Electrification.

A Government Demonstration Area in Bedfordshire.

LAST week it was announced officially that in view of the increasing opportunities for the spread of the use of electricity which will follow upon the coming into operation of the schemes framed by the Electricity Commissioners under the Electricity (Supply) Act, 1926, and now being rapidly adopted by the Central Electricity Board, the Minister of Transport had for some time past had under consideration means whereby the advantages of electricity supplies to typical rural communities could best be demonstrated and the demand therefore tested.

He has been impressed with the desirability of initiating an experiment with the object, primarily, of ascertaining what results may be expected from the development of electricity supply in a typical rural area if proper methods of canvassing and of demonstrating the advantages of the service are adopted, and if facilities are afforded to enable the prospective consumer to wire his premises and obtain the necessary electrical apparatus under some system of deferred payments.

After careful consideration of various districts in Great Britain which might suitably be selected for the experiment, an area of approximately 100 square miles in extent, lying to the north and west of Bedford and within the area of supply of the Bedford Corporation, has been selected and, as a result of an application made by the Bedford Town Council to the Development Commissioners, the Treasury has agreed that for a period not exceeding 10 years advances shall be made from the Development Fund to the Town Council of such sums (not exceeding £8,000) as may be required to meet 75 per cent. of the actual annual deficits on the working of the scheme, if any, such advances to be subsequently repayable out of surpluses.

In order that the progress of the scheme may be facilitated and its results closely watched, it has been arranged that the advice and assistance of the Electricity Commissioners and of the Development Commissioners will be available to the Bedford Corporation, which has agreed to co-operate in every way.

It may be explained that the scheme alluded to above is being undertaken experimentally with the object of demonstrating how electricity may be brought within the reach of everybody living in a strictly rural area in which mixed farming is the main industry. The area to be covered by the proposed scheme, according to the 1921 census, has a population of 17,937, with 4,573 dwellings.

The estimated cost of the work is understood to be £129,385, of which, however, £28,901 has already been expended by the Corporation during the last four years. The estimates are based on the assumption that at the end of six years 75 per cent. of the dwellings in the area will have been connected, and that by then the average revenue from every village connection will be £6, from every farm £18, and from each country residence £30. It is primarily on the realisation of these assumptions that the financial success of the scheme rests. The estimates also provide for the suspension of repayment of capital, or of payments to the sinking fund, during the first five years on a portion of the capital. It is estimated that during each of the first three years there will be a deficit, namely, in the first year £1,816 (constructional year), second year £2,845, and that from the third year onwards there will be an excess of income over expenditure, and that the accumulated deficit will be wiped off at the end of the fifth year.

It was in recognition of the fact that the adoption by the Corporation of the scheme is estimated for a period of three years to entail an annual loss that the Minister of Transport recommended the Treasury year by year to advance loans to the Corporation out of the Development Fund, subject to payment of interest, but not repayable until the scheme becomes self-supporting.

The experiment will be watched closely by all who have already initiated similar schemes, or contemplate doing so, in other parts of the country. It will be carried out under favourable and attractive conditions, which is an additional reason why the venture should be successful and thus vindicate those engineers who have long contended that the electrification of rural areas is a practical proposition, and remunerative, when undertaken in the proper spirit, and adequate facilities are provided for doing the preliminary installation work.

Electro-plating Equipment.

Some notes on plating vats and methods of heating the solutions in them.

(*Extracts from a Paper read before the* ELECTROPLATERS' AND DEPOSITORS' TECHNICAL SOCIETY.)

AT the last meeting of the Electroplaters' and Depositors' Technical Society, Mr. J. W. Perring read a paper on the above subject, in the course of which he said there were a number of materials that could be used for making vats, or containing vessels, for electro-plating solutions; their use was determined by cost, ease of manufacture, and suitability for the solutions they were to contain. They ranged in size from a few gallons to 50 feet or more in length, as follows: wood vats without linings; slate vats; stoneware and glass, round and rectangular; cast-iron, enamelled and plain; iron, rivetted and welded; lead-lined wood vats; asphalte or hard rubber; ebonite lined; concrete, or brick.

Heating Solutions.—There were a number of methods of heating solutions: by steam, gas, thermosyphon, and electricity. Solutions were usually required to be worked at about the following temperatures: cold 15 deg. C., warm 100 deg. F., hot 40-50 deg. C. Cold solutions could be maintained at fairly constant temperatures by keeping the shop at an even temperature, especially at night; if more attention were paid to this, many of the troubles attributed to the weather might be eliminated. Warm solutions could be heated in various ways, but for hot solutions electricity was too costly, and steam or gas was usually used.

Steam heating was probably the cheapest method. Steam could be allowed to pass direct into the solution, and the noise prevented by means of a special fitment. That method was convenient for hot-water tanks, but not solution, as the steam condensed and gradually filled the vat. Steam coils should be designed to bring the solution up to temperature quickly, and the steam then be regulated to maintain the required temperature.

Gas could be burnt under a suitable steam boiler, but would probably be dearer than coal. Iron tanks were usually heated by means of rows of Bunsen flames, the top of the luminous cone being level with, or just below, the bottom of the tank. Lead-lined vats could be heated by means of a lead tube, with a sealed bottom containing an inverted Bunsen burner, the tube being suspended vertically in the solution, actually a gas immersion heater.

Electric Heating.—Usually electric heaters were of the immersion type, the outer casing being made of a material not affected by the solution. That was an ideal method of maintaining the solution at a constant temperature throughout the 24 hours, especially when only about blood temperature was required, *e.g.*, for building up with nickel. Immersion heaters with special casings, such as silica, were fairly expensive.

In designing electric heaters one met with the following difficulties: the actual element must be insulated electrically from the solution. Unfortunately, most suitable electrical insulators were also good thermal insulators; thus one had to force heat through a poor conductor, which meant that the element could not dissipate its heat so quickly; if one chose an insulating material of high dielectric strength one could make the insulation very thin. Mica answered that requirement, even when the element had to run much hotter than the solution. A number of nickel-cased immersion heaters gave trouble due to corrosion; they were placed in larger containers containing oil, and were still in use after some years.

Thermostats.—When accurate control of temperature was required thermostats could be obtained to open and close a valve, or operate a switch in case of electric heating. Even when accurate control of temperature was not required, they would soon pay for themselves, as they prevented waste of energy.

Discussion.

Mr. E. A. OLLARD said that when iron vats were used for chromium solutions, if the work tended to approach the sides of the vat sheets of glass could be hung round the sides, rough glass containing wire netting being very suitable for the purpose. With regard to immersion heaters, filling them with oil prevented much trouble. It was necessary to see that they were not earthed, since if the anode side of the circuit were also earthed they would be likely to corrode anodically.

Mr. F. MASON said that electrical measuring instruments were still not as much used in the plating shop as they might be, while occasionally they were misunderstood. In the case of silver-plating plant, often the water which was allowed to run to waste contained appreciable quantities of recoverable silver; in one plating shop where that water was collected and evaporated by means of waste steam, the cost of the plant was recovered about twice over in the course of a year's working.

Mr. S. E. WEILL said that wood, if properly prepared, for example, pitch pine free of knots and thoroughly soaked in water, was the best material for vats. The chief objection was the expense, about three times that of lead-lined vats.

One of the best ideas for strengthening tanks was an American one, the trussed-beam method being used instead of upright supports.

Mr. A. E. BOULTER said a very necessary plating requisite which had yet to be produced efficiently was a false bottom which made it possible to recover dropped work quickly.

Mr. R. HAMMOND could not agree that earthenware vats were ideal. Generally they failed through being porous, or due to the separation of the glaze in large flakes from the outside.

Mr. H. LOVELOCK said that match linings to nickel vats often resulted in brittle and cracked deposits in thick nickel deposition. Electric heaters, though giving good results, were much dearer usually than any other means of heating.

The author responded to the discussion, and was accorded a vote of thanks.

Domestic Electrical Developments.

New Cooking, Heating, and Cleaning Devices for use in the Home.

Portable Meter Box-Seats.

For use in hotels, boarding houses, and the like, the BROMPTON & KENSINGTON ELECTRICITY SUPPLY CO., LTD., 254, Earl's Court Road, has introduced in its service a range of portable meter boxes, figs. 1 and 2, consisting of readily portable boxes or box-seats fitted with electricity prepayment meters. Each box-seat is fitted with a plug base of a certain size, into which

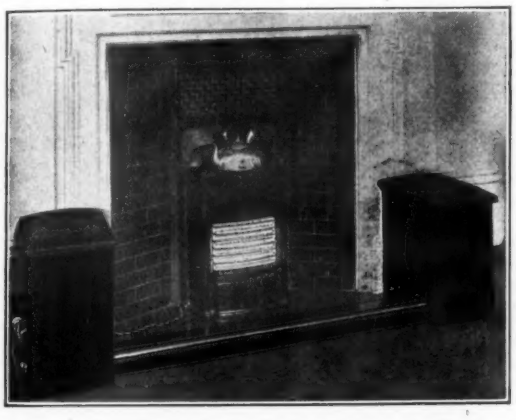


Fig. 1.—Curb Fender Incorporating Meter Box.

the plug attached to the flexible cord of the electric fire fits. A flexible cord is taken from the meter box with a plug top attached, which fits into the plug base on the skirting of the room in which the electric fire is used. This latter base is of a different pattern or gauge to that on the box-seat, so that it cannot be plugged directly into the wall plug base, but must be connected through the medium of the meter box. The meter box-seat is usually supplied in the form of an upholstered seat, but it can be made up in any convenient size, shape or material, to match furnishings, and is thus as unobtrusive as possible. Fig. 1 shows a curb fender with one end fitted as the meter box. The other end can be used for storing the kettle and utensils for heating water, &c., used on the boiling ring of the hotel-pattern radiator. The

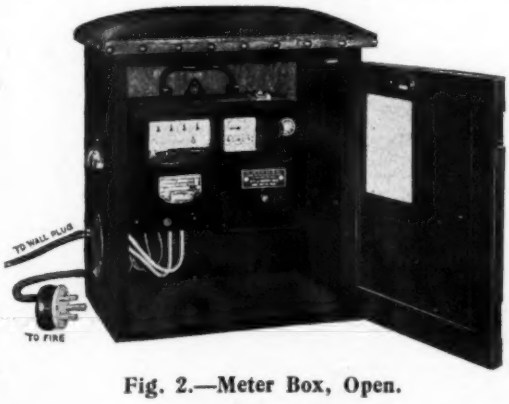


Fig. 2.—Meter Box, Open.

advantage of the device is that, when a guest desires to have an electric fire, it is sent to the room (with prepayment meter) all ready for use. Further, when the electric fire is not required it can be removed complete with the meter box. In this way the proprietor need only provide as many meters as the fires actually required, with a consequent saving in cost.

Electric Baking in Cape Province.

The exceptional benefits which accrue from the adoption of electricity for purposes of cooking are realised to-day in unexpected places. While we are familiar at home with the practice of baking bread and confections by means of electric ovens, it is not so usual to find similar methods employed in what is tantamount to an English village right in the

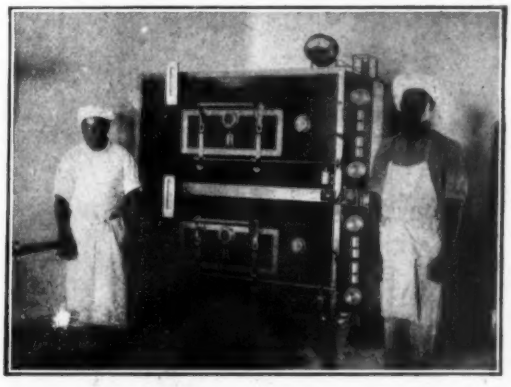


Fig. 3.—" Magnet " Oven under " Coloured " Control.

heart of the " Dark Continent." Yet a " Magnet " double-deck oven, fig. 3, manufactured by the General Electric Co., Ltd., Magnet House, Kingsway, W.C.2, has recently been installed in Worcester, in the Cape Province, providing an example of enterprise and an appreciation of modern efficiency in baking processes, which might well be regarded as a striking commentary on the nonchalance to be observed in many directions at home in this particular phase of activity. The oven is working to the entire satisfaction of the proprietor as to quality of output and economy in running costs, and apparently the coloured bakers concerned in the baking operations have already proved adept at their work.

An Automatic Electric Iron.

The " Embob " electric safety iron, fig. 4, which has been introduced recently in this country by Mr. Maurice Bobin, 15, Farringdon Avenue, E.C.4, is fitted with an automatic safety device designed to cut out the element when its tem-

Fig. 4.—The " Embob " Automatic Iron.

perature reaches 200 deg. C. The automatic switch is operated by the expansion of a brass rod. The switch, which is carried at the back of the handle, can also be switched on and off by hand by means of the buttons at the top and side, respectively. The iron is highly plated, and weighs about 6 lb. The loading is 450 W.

An Electric Washer with a Heater.

Our attention has been directed to the " Locomotive " electric washing machine marketed in this country by the SLOAN ELECTRICAL CO., LTD., 8, 10 & 12, Golden Lane, E.C.1. By means of a crank on the shaft of the driving motor the main copper tank is moved to and fro, and by reason of this and

the shape of the tank the water is given a " figure 8 " motion, and is swirled through the clothes. Beneath the tank is fitted a 600-W heating element which can be switched on a reasonable time before washing is commenced, to boil the water.

Electric Cooking Experiments.

" Electro-cooking " may become popular among housewives of the future if experiments now being conducted in the laboratories of the Iowa State College in the United States prove successful. For some time now experiments have been made in cooking foods by passing electric currents directly through them, and it is said that the method is economical in both the time taken and the current used. It is possible, it is claimed, by this method, to cook five potatoes in about 14 minutes, using half as much current as by the ordinary method of baking. It is said that the foods are cooked simultaneously all the way through, and that potatoes, when examined under the microscope, show that the starch grains have been actually exploded by the intense heat.

A Panel-warming System.

It is claimed that just as a modern lighting installation provides for evenly-diffused illumination, free from glare, so the Dulrae (electric) panel-warming system, a production of Messrs. Grierson, Ltd., 4, Bloomsbury Place, W.C.1, provides an evenly-diffused warmth, free from hot-spots, by means of relatively large areas of ceiling warmed to a low temperature, 85/95 deg. F. with an outdoor temperature of 35 deg. F. In buildings and rooms where this system has been adopted, it has been found by test that all walls, ceilings, floors and furniture attain a temperature either equal to or slightly higher than the air temperature.

The standard panels for use on 200/250-V systems are manufactured in 400-W units, having an area each of 12 sq. ft. Convenient sizes are 6 ft. by 2 ft. or 4 ft. by 3 ft. Small panels, 3 ft. by 1 ft., for use four in series, are also provided to meet

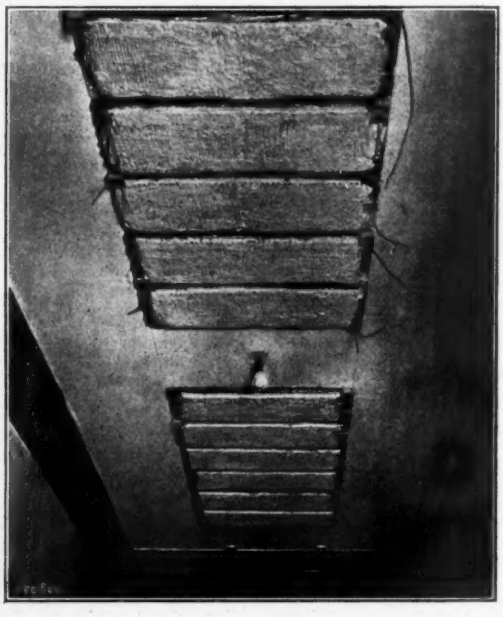


Fig. 5.—Group of Small " Dulrae " Electric Panels fixed to Hall Ceiling.

special requirements, such as long shallow panels, the provision of space for lighting outlets, and so on. A feature of the system is the automatic temperature control adopted, and the patentees emphasise the desirability and the economy of operating the system continuously during the heating season, *i.e.*, 24 hours per day for seven months in the year.

An interesting proof of the heat storage of a building is shown by the following figures taken during a week in February, when the outdoor temperature varied between 27 and 42 deg. F. The figures are reduced to units per deg. rise in the final column, and indicate the economy of continuous use; they are for the first weeks run of a new installation :—

Day.	Mean outdoor temp.	Mean indoor temp.	Mean temp. rise.	Units used.	Units per deg. rise.
Tues. ...	31.5	60.0	28.5	282	9.9
Wed. ...	30.5	59.1	28.6	232	8.1
Thurs. ...	34	58.6	24.6	196	8.0
Fri. ...	35.5	60.0	24.9	190	7.65
Sat. ...	39	60.6	21.6	149	6.9
Sun. ...	37.5	60.5	23.0	155	6.75
Mon. ...				155	

Regarding cost of operation, a room on the first floor of an old London square house, facing north, containing a cube of 3,320 feet, and averaging one occupant, shows the following result on automatic temperature control :—

Month.	Days.	Units used.	Total cost at 1d. per unit.	Cost per day.	Cost per day per thousand cubic feet.
March ...	23	241	20/1d.	10½d.	3.16d.
April ...	26	310	25/10d.	1/-	3.61d.
May ...	15	68	5/8d.	4½d.	1.35d.

Another interesting feature of the system is that due to the heat storage of the building, materials and furniture, after the installation is switched off, the fall in temperature is very low, *e.g.*, 1½ to 2 deg. per hour for a substantially-constructed building. This indicates that time switches can be installed to ease peak loads on systems where they only persist for a short period and occur at a definite time each day. It is desirable that each room should be provided with its own temperature-control device, so that the occupants can adjust the temperature to the degree desired. A feature of interest to supply engineers who are concerned regarding the abnormal increases in the maximum demands, is that installations on this system clearly consume the maximum number of units during the cold night period. A reply to the criticism that the system is topsy-turvy, for heat rises, and therefore the floor is the right place for the panels, is that warm air rises because it is lighter than cool air; radiant heat waves, just as radiant light waves, can be directed in any direction desired, and the patentees claim that the panels " spray " the occupants of the room with low-temperature radiant heat rays, both directly from the panels and indirectly from walls, windows and furniture.

Fig. 5 shows a group of 12 small parcels, each 36 in. by 12 in., fixed to an existing hall ceiling. The panels are shown, of course, after erection, but before plastering.

Selected Radio-telephone Apparatus.

Recent Developments and Improvements.

The " Hypermu " Transformer.

An interesting recent addition to the range of products marketed by Radio Instruments, Ltd., is an inter-valve transformer in the construction of which one of the new nickel-iron alloys is employed. We are informed that the National Physical Laboratory test curves indicate that not only is the amplification of the new component very great, but that it is also maintained at an approximately uniform rate over the whole range of useful frequencies. Although this is by no means the first inter-valve transformer using nickel-iron alloy, it is claimed to be the first to be fitted with an iron screen enclosed in a bakelite case. The remarkable curve obtained with this iron is largely due to the arrangement of the magnetic circuit, allowing the use of a small number of turns to give high primary inductance. An additional useful factor in the design is that the primary effective resistance and inductance produce the exceptionally straight-line curve when the whole of the d.c. component is shunted by a 30,000-ohm resistance. The curves are very good for a commercial inter-valve transformer of its size and weight, and reflects credit on British research and enterprise.

The " Ethogram."

The handsome instrument marketed under the above name by Burndept Wireless (1928), Ltd., is self-contained, and needs no external connections. As its name implies, a four-valve radio receiver, gramophone, and loud-speaker are combined complete in the one cabinet. The screened-grid and power valves work with a frame aerial and the gramophone reproduces electrically, of course; 30 records can be stored alongside the turntable, which is driven silently and controlled by a push button. A single switch controls wavelengths of from 235 to 540 and 900 to 2,100 metres, and the tuning dials are calibrated in wavelengths.

A Philips Receiver.

Not often does one hear of a receiver designed for both short- and long-wave reception with high-frequency amplification from 10 to 2,400 metres. Messrs. Philips Lamps, Ltd., now supply a set (type 2802) that is intended for loud-speaker reproduction over that range. The circuit consists of a screened-grid high-frequency valve, a detector, a low-frequency amplifying valve and a pentode output valve; the latter can be switched out of circuit if desired. Six interchangeable coils are used to cover the tuning range, and tuning controls are the same on all wave-lengths; below about 100 metres the tuning is necessarily critical, but calibration curves are given for wave-lengths below 160 metres. A feature is that there are no flat spots (when oscillation suddenly stops), and no threshold howl when tuning near the oscillation point on the ultra short-wave lengths. The low-frequency part of the set can be used in conjunction with a gramophone pick-up for

reproduction by means of a loud-speaker. Any ordinary aerial may be used, but on the shortest waves an indoor aerial of a few feet of wire is often all that is necessary. The receiver is enclosed in a metal and bakelite case built to withstand extremes of temperature, and it is claimed to be possible to use a mains h.t. supply unit without hum on wave-lengths down to 10 metres, which feature has hitherto been unobtainable with an ultra short-wave receiver.

Ferranti Transformers.

Messrs. Ferranti, Ltd., recently advised us that in future all audio-frequency and output transformers manufactured by them will have their primary and secondary terminals reversed from what has hitherto been their standard positions. Looking at a transformer from the primary side the plate terminal will in future be on the right-hand side, and in the same way observed from the secondary side the grid-bias terminal will be on the right-hand side. This alteration, whilst in no way affecting the performance of the component, should lead to an appreciable simplification of wiring.

A Testing Instrument.

The Standard Wet Battery Co. has sent us a sample "Wates' Volt-Amp. Meter." This useful little instrument, in a strong leatherette case, is of pocket size, and should enable the user to detect many of the common faults to which radio receivers are subject. It has a triple reading dial: 0 to 6 volts, 0 to 150 volts, and 0 to 30 milliamperes, its resistance being of the order of 5,000 ohms. It is quite simple to adapt the meter for many purposes, including the testing of battery eliminators, and the copious instructions supplied with it are helpful. Simple periodical check tests cannot fail to improve reception.

New Electrical Devices, Fittings, and Plant.

Readers are invited to submit particulars of new or improved devices and apparatus for publication in this Section.

An Automatic Motor-starting Device.

Various patents taken out by Mr. R. LAGNIEZ, of Neuilly-sur-Seine, have resulted in an unusual device for the automatic starting of electric motors which is about to be introduced in this country by Mr. Grunwald, 112, Strand, W.C.2. The apparatus is designed for attachment to the motor shaft, with

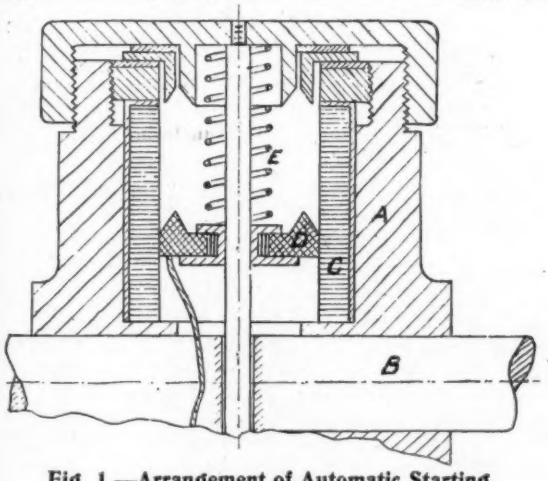


Fig. 1.—Arrangement of Automatic Starting Equipment.

which it revolves, its operation depending upon the centrifugal force produced. The principle is that of the potentiometer type of variable resistance, part of all of the resistance wire, according to the stage in the starting operations, being in series with the motor windings through a sliding contact. Fig. 1 shows simply the arrangement of the apparatus. A cylindrical holder A is rigidly secured to the motor shaft B, and

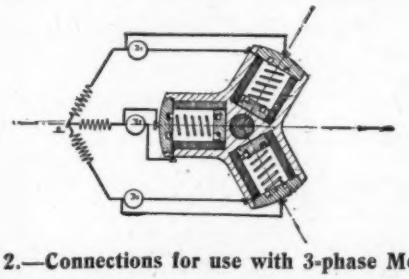


Fig. 2.—Connections for use with 3-phase Motor.

carries at its interior surface, also in cylindrical form, the wound resistance wire C. The sliding contact D moves outward under the influence of the centrifugal force and against the tension of the spring E. Fig. 2 depicts the arrangement for a 3-phase wound-rotor motor. The following claims are made for the apparatus—that it can be easily adapted to most standard motors, in many cases inside the motor frame; that it permits no abrupt variation of current during the period of starting; that there is no sparking at the points of contact on the resistance wire; and that the starting time can be regulated by calculation of the resistance.

A Cable-trunk System.

The "Turret" cable-trunk conduit system recently introduced by POWER CENTRE CO., LTD., 15, Park Lane, Liverpool, consists of heavy-gauge sheet-steel troughing A, fitted with detachable cover plating B on its front side. The upper side of the trough, fig. 3, is so shaped by a projecting continuous lip C as to throw off any drip or moisture which may collect on the top, and the cover plate fits well inside this projection. The cover also has a continuous projecting lip on its lower edge D, which again serves to carry away any drip, the troughing being made of one continuous sheet, forming the base, side and top, and is practically damp-proof. The cover plate is secured to steel strips E at intervals, these being easily removable to

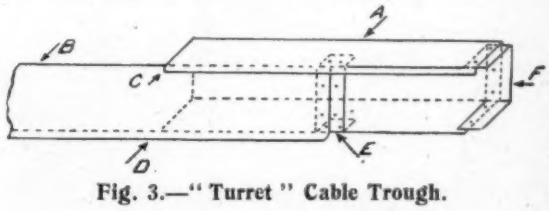


Fig. 3.—"Turret" Cable Trough.

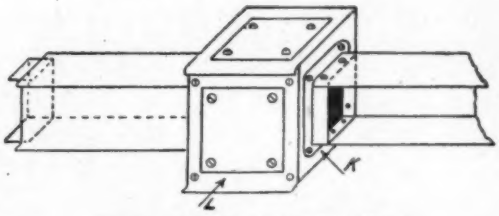


Fig. 4.—"Turret" Tee Box.

enable the cables to be readily pushed into place in the trough and secured, pending the replacing of the cover. Cables are not damaged in any way, it is claimed, in installing, and no draw-in boxes are required, such as are necessary at intervals with heavy cables, or groups of cables in heavy conduit. The trunking is supplied in 8-ft. lengths in various sizes, and may be fitted with welded block ends, or detachable block ends suitable for drilling. The lengths are each fitted with one butt strap—joint piece F, which is rivetted in position and is drilled to enable it to be bolted to the next section, the small bolts and nuts necessary being supplied with the trunking. Where trunking is required for vertical runs a simple overlapping cover is supplied; this is also useful for laying in floors, where it may be necessary to put the cables in from the upper side. Special bends, angles or tees of any shape can be supplied, and are made to templet. A universal angle or tee box, fig. 4, which can also function as an inspection or connecting box, is also supplied as standard. This box is so constructed that the detachable socket K is interchangeable with any of the cover pieces L, which are fitted on the blank sides

so that outlets can readily be arranged in any desired direction, and unnecessary outlets covered, all sockets and plates being readily interchangeable one with another. The trunks can be secured to walls or ceilings by any suitable method, or special hangers or brackets can be supplied to suit contractors' requirements.

A Gallery for Shop-window Reflectors.

Much of the success of shop-window reflectors depends upon the correct focus of the lamp, and as lamps of different wattages have varying light centre, some means of adjustment to obtain correct focus is necessary. This problem has been met by an ingenious gallery invented and patented by PHILIPS LAMPS, LTD., 145, Charing Cross Road, W.C.2. The most notable feature of the gallery is its simplicity. It is made in two parts, fig. 1, the shade-carrying part fitting inside the other and being held in the desired position by means of three pins which engage in appropriate slots, according to the wattage of the lamp in use. A coil spring in the inside of the outer portion maintains rigidity. It will thus be readily seen that it is a simple matter to ensure the correct focal position of the filament. When erecting or removing the reflector for cleaning purposes, it is unnecessary to interfere with any screws, as the bottom half of the gallery holding the reflector is disengaged by a simple turning movement. The light centres of electric lamps having been standardised by the leading lamp manufacturers, the galleries are suitable for use with any make of lamp. The makers supply full particulars with each gallery, showing the appropriate slots to be used for various types of reflectors and sizes of lamps.

Fig. 5.—" Philips " Shop-window Reflector Gallery.

A New Radio Direction Finder.

Marconi Apparatus for Naval Vessels.

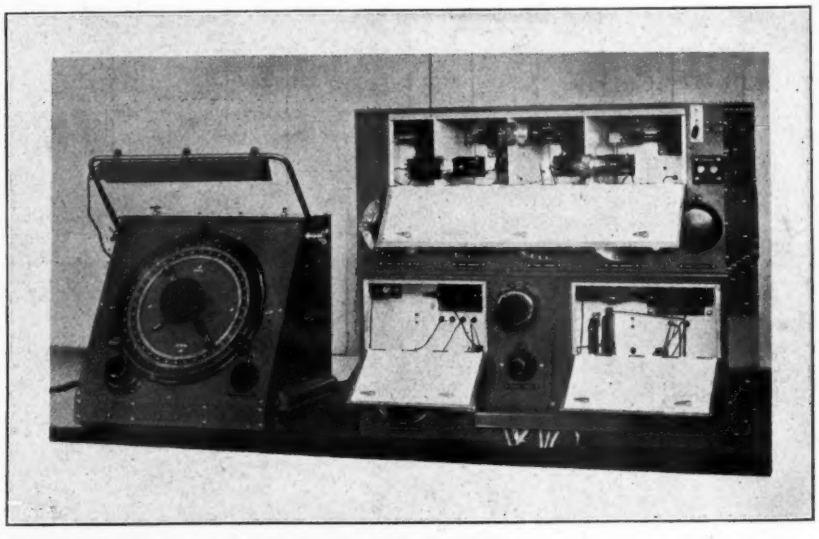
A NEW wireless direction finder known as the Type DFM.4 has been developed by the Research Department of Marconi's Wireless Telegraph Co., Ltd., for use primarily on all classes of naval ships as a navigational instrument.

Experience has shown that to meet naval requirements a wireless direction finder must be capable of taking accurate bearings from continuous-wave, interrupted-continuous-wave, spark, or telephone, transmitters over a wide range of wavelengths. The new equipment comprises three parts—the frame aerial, the radio-goniometer, and the tuner and amplifier, as illustrated below. The frame aerial, working on the well-known Marconi-Bellini-Tosi principle, consists of two fixed loops totally enclosed in strong metal tubes that are mounted on a pedestal. The latter is rigidly fixed to the deck of the ship and the leads to the receiver are well protected by being carried down through the centre of the pedestal. In the receiver, the tuner and amplifier are combined as one compact unit, and cover a range of from 300 to 4,000 metres. To obtain this wave-range three sets of coils are eemployed, and by means of a single switch mounted on the front of the receiver any one set of the coils can be switched into circuit; an indicator shows which coils are in use and their wave-range. Three Marconi shielded valves are used to provide high-frequency amplification, and four condensers, which are calibrated in metres, are used to tune the grid circuits of the high-frequency and detector valves; each of the condensers can be adjusted independently, but a common control enables them to be varied over a range of approximately 10 per cent. on either side of the wavelength to which they are set.

For the reception of continuous-waves a separate heterodyne device, mounted in the amplifier, is employed. In all, seven valves are used, of which three are high-frequency amplifiers, one is a detector, one a note magnifier, and one a local oscillator generator, which can be used as an additional note magnifier if required, and one a coupling valve.

In order that the " sense " of bearings over the whole wave-band of the receiver may be obtained with the aid of only a short vertical aerial, a stage of valve amplification using the coupling valve is employed for the vertical component.

The radio-goniometer is constructed as a separate part which can be fixed in any convenient position. Two calibrated scales from which the bearings are read are mounted on the face of the instrument. The inner scale is fixed and bearings taken from this scale are relative to the centre line of the ship. The outer scale can be rotated until the figure indicating the ship's true course is at the top of the dial opposite the zero mark of the inner scale, and then, if the ship is steady on her course, the bearings reading from the outer scale will be true bearings.



Figs. 1 and 2.—Marine Radio Direction-Finding Outfit.

Power Plant in America.

Small isolated electric power generating undertakings have decreased appreciably in number during the last few years.

ACCORDING to the National Electric Light Association, one of the consequences of the consolidation of smaller enterprises into larger operating undertakings, as a practical result of widespread interconnection, has been that the number of electric light and power enterprises, both corporate and municipal, has strikingly decreased since 1922. The United States Bureau of the Census summary of electrical industries for the year 1927 indicates that at the end of 1922 the systems serving the United States comprised 3,774 commercial enterprises and 2,581 separate municipal plants, making a total of 6,355. Five years later the number of commercial enterprises had decreased to 2,135, a reduction of 1,639, or of 44 per cent., while the number of municipal plants had decreased to 2,192, a diminution of 389, or of 15 per cent. A grand total of 2,028 enterprises have thus been consolidated and unified during the five-year period covered, a process explained by the Census as being "due to the centralisation of ownership, or control, and the absorption of independent generating stations accompanying the extension of transmission lines" in the case of commercial systems, and "to the abandonment of municipal generating stations and the acquisition of municipal distribution lines by commercial systems" in the case of municipal undertakings.

A similar striking decrease is evident in the number of power houses during the five-year period under review, although the total installed capacity of the generating equipment has shown a very large growth. At the end of 1922 there were 5,444 power plants devoted to the service of electricity supply and their total capacity was 14,313,438 kilowatts, whereas at the end of 1927 the number had decreased to 4,387, a diminution of 1,057, or of 19 per cent.; at the same time, their total capacity stood at 25,802,530 kilowatts, an increase of 80 per cent. The replacement of the smaller and isolated power houses by co-ordinated systems of greater size and more efficient operation is graphically illustrated by the average size of the power houses in those two years: in 1922 the average generating plant in the United States had an installed capacity of 2,628 kilowatts; in 1927, the figure had grown to 5,880 kilowatts. In other words, although the number of power houses declined by one-fifth, their average size more than doubled during the five years.

TABLE I.—SUMMARY 1927 AND 1922.

	1927.	1922.	Per cent. Increase or Decrease.
Number of establishments, total ...	4,327	6,355	−31.9
Commercial ...	2,135	3,774	−43.4
Municipal ...	2,192	2,581	−15.1
Number of generating stations	4,387	5,444	−19.4
Prime movers.			
Total number	12,007	13,242	− 9.3
Total horse-power ...	35,622,593	19,850,860	+79.5
Steam engines—			
Number ...	2,264	4,175	−45.8
Horse-power ...	1,054,922	1,371,296	−23.1
Steam turbines—			
Number ...	2,852	2,350	+22.4
Horse-power ...	24,187,470	12,354,551	+95.8
Internal-combustion engines—			
Number ...	3,172	3,256	− 2.6
Horse-power ...	545,238	302,995	+79.9
Hydro-turbines—			
Number ...	3,719	3,481	+ 6.8
Horse-power ...	9,834,963	5,822,018	+68.9
Generators.			
Number ...	11,948	12,701	− 5.9
Kilowatt capacity	25,802,530	14,313,438	+80.3
Output of stations, kilowatt-hours ...	74,654,531,374	40,291,536,435	+85.3
Number of customers	21,782,080	12,709,868	+71.4

The total number of customers of "electric service" is reported by the Census as being 21,782,080 at the close of 1927, as against 12,709,868 at the close of 1922, which represents an increase of 9,072,212 during the five years, or a growth of 71 per cent.

The output of electricity is recorded by the Census as 74,654,531,374 kilowatt-hours during 1927, as compared with 40,291,536,435 kWh during 1922, an increase of 85 per cent. Some qualification must, however, be made in all these comparisons; for instance, the "coverage" of the 1927 Census is more complete than it was in 1922, for the reason that the earlier enumerations eliminated many enterprises which were partly engaged in electric tramway operations and classified those companies, not as electric light and power, but as "street railways," which discrepancy was rectified in the Census for 1927. In addition, attention must be drawn to the detailed figures for the state of North Carolina, which shows totals in 1927 of five times the figures for 1923; this situation arises largely from the expansion of the operations of subsidiaries of the Aluminium Company of America, whose capacity and electricity output are predominantly employed in the manufacture of the metal.

The detailed summary for the United States by the Census is as shown in Table I.

Legal.

Cooper Roller Bearings Co., Ltd., v. Power Plant Co., Ltd.

LEGAL argument was heard before Mr. Justice Talbot in the King's Bench Division on May 16th in this action, which was reported in our issue of April 19th (p. 722).

On April 12th his LORDSHIP found that the plaintiffs had established a *primâ facie* case for the recovery of a bill of over £800 for work done in maintaining certain friction clutches supplied to rolling and other mills at the order of the defendants. The defendants contended that the clutches supplied were unsuitable for the purpose for which they were required, and that plaintiffs had committed breaches of contract and warranty.

Mr. G. O. SLADE, for the plaintiffs, now asked that judgment be entered for the Cooper Roller Bearings Co. for an amount to be determined by the Official Referee and for costs of the hearing to be taxed, with judgment for the plaintiffs on a counter-claim with costs. Counsel also asked for liberty to apply to the Court again when the amount had been determined.

Mr. PRITT, K.C., said that if the defendants desired to appeal, he hoped their right to do so would not be prejudiced.

His LORDSHIP, in granting Mr. Slade's application, observed that the defendants' right to appeal would not be prejudiced.

Compensation Award Against the English Electric Co., Ltd.

THE English Electric Co. was sued at Preston County Court on May 14th by the dependants of John D. Darlington (27) for £300 compensation for his death on October 15th, 1928, in a motor-cycle accident. Deceased had worked as a turbine fitter, and it was stated that his father and family were wholly dependent on his earnings.

For the company it was submitted that it was only partial dependency, as the money sent home was not the sole source of income.

Judge BRADLEY awarded the amount claimed, to be divided as applicants agreed.

Swinden & Co., Ltd.

IN the Companies' Winding-Up Court on May 14th, Mr. Justice Maugham made an order for the compulsory winding-up of Swinden & Co., Ltd., agents for mining and electrical plant, on the petition of the Albion Iron Co. (London), Ltd.

Correspondence.

Correspondents should forward their communications as early as possible. No letter can be published unless we have the writer's name and address in our possession.

The Compulsory Earthing of Prepayment Meters.

As a matter of fact, I am married, and it appears, from Mr. L. F. S. Sington's letter, that I am very fortunate.

Perhaps the explanation lies in the fact that my wife is a Scotch lady.

It is a well-known fact that the Scotch people are very much more generous than the Southern race, who love to tell the usual tales about the man from Aberdeen.

What all this has to do with the compulsory earthing of prepayment meters I don't know, but it certainly introduces a pleasing topic, namely, the perfect Scotch wife!

A. J. Abraham.

Bexleyheath, *May 24th*, 1929.

I have been a subscriber to your valued REVIEW for many years, and after reading Mr. A. J. Abraham's letter on "The Compulsory Earthing of Prepayment Meters," I have at last found a real live earthing specialist. I simply love those slight tingles. No doubt this super-electrician would replace a fuse with a piece of wet string, or repair a fuse board with a 5-ampere nail. No doubt when the lady and her "hubby" get slight shocks they both burst their sides a-laughing.

I have been on electrical work for nearly 50 years, and am now looking forward to my slight tingle. I do wish, when I get it, that Mr. A. J. Abraham could be holding my hand. Of course, I agree that manufacturers should get rid of metal casings altogether and use instead "passover."

I agree that lead covering should be earthed in case of *fire*, but why deliberately try to break down the insulation of kettles, irons, radiators, &c., by earthing them? Why not plant them in the garden?

Mr. A. J. Abraham must tell us some more.

W. Overs,

Foreman, CROMPTON PARKINSON, LTD.

Brentwood, *May 18th*, 1929.

[This letter has been shortened.—EDS. ELEC. REV.]

132,000-volt Cables.

In recent correspondence on the Battersea station it seems that the risks of employing these cables are quite unduly magnified. To anybody who has got the least foresight, cables of 132,000 volts *must* come, as surely as steam pressure and hydraulic pressure—and now even town gas pressure—must go up; and the sooner we get experience with them the better.

What are the risks? The Pirelli cable in Italy has been working continuously for the last eight years; two 90,000-kVA transmission lines, one in New York and one in Chicago, have now been working practically for two years; and I have private information which shows that American cable manufacturers are tendering for, and guaranteeing the performance of, other large installations in the U.S.A. of these cables. Indeed, so confident are they, that one of the very foremost of them is, to my own knowledge, ready to put down such cables in London under a two-year guarantee.

However, let us consider the risks. According to *Engineering's* estimate for Battersea it will cost £2,700,000 to run perhaps 15 miles down the river, or, say, £180,000 per mile of route. Now the (66,000-volt) cables cannot cost more than £3,000 per single-core cable per mile, so that there must be at least 60 cables (20 circuits; each a complete unit).

I suppose I shall hardly be believed when I say that 300,000 kW could be transmitted by twelve 132,000-volt pressure-oil-filled cables, costing, on reliable information in my possession direct from the manufacturers, not much over £1,000,000, even for 15 miles (I submit that 10 miles, however, is amply sufficient); it would carry us down past many possible sites. Whether this figure be accepted or not, I am prepared to demonstrate (in the right quarter) that 12 cables would do the job with the amplest possible margin for spares.

Now if a (66,000-volt) cable breaks down, and they will only go down one at a time, we have 57 cables still in parallel to carry the load. Only 10 years ago a certain prominent engineer was criticised for being ultra-conservative because he preferred 10 small generating sets in his station to, say, three large ones and one spare—but 20 sets; how ridiculous!

Now take the 132,000-volt side. In the above-mentioned 12 cables there is provision equivalent to two large generating sets and *four* full-sized spare, or *stand-by* sets (this may not be clear in certain quarters, but let it stand; I can justify it). What generating-station engineer would not be delighted if he could have such a stand-by equipment and at such a relatively low cost!

The fact that the New York and Chicago installations have now been running without any hitch for nearly two years, under strenuous conditions as regards load, is conclusive proof that they are going to stand; that nothing short of the perforation of the lead sheathing or the gradual failure of the dielectric can put them permanently out of working. In the early days of 33,000-volt cables the mistake was made of not testing the cables under heavy over-loads. *We have learnt our lesson*, and it will not occur again. On the question of any radical changes developing with time in the dielectric (*apart* from loading), *that* is settled for us by the eight years of experience on the aforesaid Italian line.

If we save £1,700,000 by using pressure-oil-filled cables, and if—to assume the worst case conceivable—these began to go wrong after eight years, and if we had to replace the whole lot, bit by bit, within 12 years (total), we still have that £1,700,000 (plus the saved interest and depreciation over eight years) with which to buy two complete sets of new cables, extending the equivalent life *to* 36 *years*, at least. Who is to say that 66,000-volt plain-impregnated cables will last longer than 36 years?

Again, quite apart from Battersea, we *must* face the need for cross-linking in London. They are already doing it in New York. Only a fortnight ago a report came across that, owing to a heavy thunderstorm, the load at one part of New York went up suddenly by 300,000 kW. This cannot be met with 66,000-volt cables, without great expense, owing to the congestion of our streets and the annual losses in the cables. What a gain in relieved street congestion would be effected by reducing the 60 cables to 12 (spread over four different routes)!

It seems to be pretty obvious that British cable manufacturers are now discountenancing the employment of 132,000-volt cables. This, however, is a dangerous proceeding. One of these days we shall have one of the more enterprising American cable companies, *in fact, they are ready now*, actually offering to lay and guarantee in London pressure-oil-filled cables at a cost not much more than one-third of that of 66,000-volt cables. Are we going to hamper British industry and lose annually hundreds of thousands of pounds (it will come to this, shortly) waiting for these cables to have had two or three years' more "experience," at somebody's else's expense, while meanwhile American and Italian manufacturers will reap the reward of that enterprise which used to be considered an exclusively British possession?

In conclusion, I commend the extract from Sir John Snell's statement before the Parliamentary Committee in 1927 to your readers, as showing what we have got to face in the way of increased power loads in the West End of London. What if the E.D.A. *should succeed* in its efforts to increase loads? Even Sir John Snell's estimates might then be upset; and my case would be all the stronger.

This letter is neither a plea for, or against, shifting the Battersea station; it is solely a plea for giving pressure-oil-filled cables a thorough trial at as early a date as possible. Reference has been made to Battersea merely as a convenient exemplification of the issues involved. As I can claim to be the only engineer who has had made, and successfully tested (up to 720,000 volts), at his own expense, a super-voltage cable intended for 150,000-volt working, I hope I may be considered as entitled to say something on this subject.

A. M. Taylor,

Major, S.O.2.

Birmingham, *May 17th*, 1929.

An Old Problem—from a New Point of View.

It seems to me that Mr. F. T. Fawcett, in writing from a particular viewpoint—naturally—has taken a single remark of mine away from its context and, unfortunately, misconstrued it. I have said: "It is the easiest thing . . . to obtain a diploma . . . from a correspondence school," and he assumes I mean that such schools give their students work that is easy to do; he understands me to say, in effect, "there's nothing in it." Taking that as it stands, I do not wonder that at least one of his students felt discouraged, but the sentence does not stand on its own, it leads to, and supports, the central idea of the paragraph, and should be considered in its relation to that main point, *i.e.*, an employer "may wish to believe you earned that certificate honestly, but that is not enough; he must know. . . . . My statement holds: but it is not that a diploma can be obtained with little effort by a man who is conscientious, but that it can be got easily and unfairly by one who is not. Mr. Fawcett says that his schools, at any rate, can arrange for supervision of a students' final examination. Even if that were compulsory—and apparently in this country it is not—would it carry the assurance that lies behind the certificate of some well-known examining body? It is pointed out both by Mr. Fawcett and Mr. Hunt, who complained a fortnight ago of my unfairness, that many correspondence students are simply being coached for outside examinations, such as the I.E.E. examination, and it is exactly that part of the schools' work that I do agree is being efficiently applied, and the extension of which I wrote in my last paragraph but two.* If the schools' own diplomas were given under similar conditions, I believe they might supersede some of the existing public examinations, because they are more highly specialised and to the point.

I thank Mr. Fawcett for his courteous invitation, but neither the efficiency of teaching nor the scope of the work taught by the schools is the point at issue. I query neither, but I contend that diplomas actually offered by the schools themselves, even when backed by a supervisor's certificate, do not convince of the honesty of the man who wins them to an extent at all comparable with those of existing bodies—well known to a busy interviewer or employer—or to a certificate from an examining body of the nature I have suggested.

Statistics may show that many owe their jobs, or their promotion, to correspondence tuition, but they would not carry the point. I think it is for employers themselves to state what importance they attach to correspondence schools' diplomas, and the relative weight that, in their minds, is carried by a public examination.

Ric.

May 25th, 1929.

* ELEC. REV., May 10th, 1929, pp. 822-3.

Published Specifications.

Compiled expressly for this journal by a firm of Chartered Patent Agents. The numbers in parentheses are those under which the specifications will be printed and abridged and all subsequent proceedings taken.

1927.

27,558. "Electric discharge tubes." S. G. S. Dicker (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). July 17th, 1928. (310,829.)

28,474. "Receiving circuits employing local oscillation, applicable for use with multiple thermionic valves." Dr. S. Loewe and W. Kunze. October 28th, 1926. (279,861.)

29,282. "Method of, and means for electrically controlling a sub-station from a remote main station." Siemens & Halske Akt. Ges. November 3rd, 1926. (280,214.)

31,712. "Headlights for automobile vehicles." F. Espine and A. Lalaurie (trading as Etablissements Faradoc). November 24th, 1926. (281,317.)

32,252. "Electromagnetic acoustic devices." British Thomson-Houston Co., Ltd., and A. P. Young. November 30th, 1927. (310,759.)

32,262. "Thermionic valves." W. R. Bullimore. November 30th, 1927. (Addition to 192,464.) (310,760.)

32,932. "Electrical selective remote-control systems." A. Reyrolle and Co., Ltd., B. H. Leeson, and O. C. F. King. December 6th, 1927. (310,984.)

35,399. "Electrolytes for electrolytic rectifiers or the like." Fansteel Products Co., Inc. January 7th, 1927. (283,208.)

35,470. "Gramophone and the like reproducing devices, and circuits therefor." E. W. B. Gill. December 31st, 1927. (Cognate applications, 9,416/28 and 23,757/28.) (310,762.)

1928.

188. "Electric heating units." Hotpoint Electric Appliance Co., Ltd., and W. J. Sims. January 3rd, 1928. (310,902.)

271. "Moving-coil apparatus for controlling illumination and like purposes." J. Neale. January 4th, 1928. (310,986.)

416. "Device for transmitting signals from the railway track to a moving train." Allgemeine Elektricitäts Ges. January 5th, 1927. (283,165.)

2,299. "Thermionic valves." Edison Swan Electric Co., Ltd., and L. H. Soundy. January 24th, 1928. (310,903.)

2,300. "Circuit arrangements employing thermionic valves." Edison Swan Electric Co., Ltd., and L. H. Soundy. January 24th, 1928. (310,764.)

2,567. "Electric alternating-current measuring instruments." Nalder Bros. and Thompson, Ltd., and C. L. Lipman. January 26th, 1928. (310,766.)

2,690. "Portable electric battery lamps." H. F. Joel, Sen. January 27th, 1928. (310,824.)

2,840. "Piezo-electric crystals." Dr. E. Giebe and Dr. A. Scheibe. January 28th, 1927. (Patent of addition not granted.) (284,357.)

3,072. "Driving of reciprocating machines by asynchronous electric motors." Siemens-Schuckertwerke Akt. Ges. February 10th, 1927. (285,056.)

3,079. "Automatic cleaning devices for instrument dials and like designation plates." Automatic Telephone Manufacturing Co., Ltd., and W. H. Paulett. January 31st, 1928. (310,787.)

3,472. "Electric oscillation generators." N. W. McLachlan. February 3rd, 1928. (310,915.)

3,485. "Electrical controlling apparatus." Westinghouse Brake and Saxby Signal Co., Ltd. May 7th, 1927. (290,152.)

3,604. "Wireless loud-speakers, microphones, and the like." A. Stanley. February 6th, 1928. (310,997.)

3,700. "Manufacture of electrolytic zinc." I. G. Farbenindustrie Akt. Ges. February 14th, 1927. (285,373.)

4,062. "Terminal for electric leads." E. Elliot. February 9th, 1928. (311,011.)

4,102. "Electrical transmission and/or distribution systems." W. T. Taylor. February 9th, 1928. (311,013.)

4,316. "Photo-electric signalling, regulating, or measuring device." Neufeldt & Kuhnke Betriebe-Ges. February 10th, 1927. (285,062.)

4,611. "Electrical turning gear for starting internal-combustion engines." F. H. Royce. February 14th, 1928. (Patent of addition not granted.) (311,020.)

5,031. "Device for fastening electric bonding conductors to the rail base." R. Bomig. June 3rd, 1927. (291,425.)

6,630. "Alternating-current electrical generators." C. Lorenz Akt. Ges. March 18th, 1927. (287,167.)

6,754. "Mercury-vapour lamps or quartz lamps." Quarzlampen Ges. March 4th, 1927. (286,317.)

7,926. "Diaphragms for gramophones, telephonic loud-speakers, and the like." T. H. Tuite. March 15th, 1928. (311,044.)

8,011. "Electric storage batteries." J. Morris. March 16th, 1928. (311,045.)

9,455. "Piezo-electric substances." P. Freedman and W. J. Rickets. March 29th, 1928. (Cognate applications, 9,459/28 and 9,478/28.) (311,055.)

9,695. "Device for measuring electric resistances with the aid of a cross-coil instrument." Siemens & Halske Akt. Ges. April 9th, 1927. (288,288.)

11,125. "Electromagnetic transmission gearing." L. Mellersh-Jackson (Maschinenfabrik Esslingen). April 14th, 1928. (Convention date not granted.) (288,979.)

11,188. "Sound-reproducing devices." Graham Amplion, Ltd., and P. K. Turner. April 10th, 1928. (311,071.)

11,823. "Picture telegraph, television, and the like systems." A. Carpmael (Telefunken Ges. für Drahtlose Telegraphie). April 21st, 1928. (311,075.)

12,408. "Arrangement for the testing of electric resistances by means of a cross-coil instrument." Siemens & Halske Akt. Ges. August 3rd, 1927. (Addition to 288,288.) (294,976.)

12,802. "Electric transformers." General Electric Co., Ltd., W. Wilson, and T. W. Dann. May 1st, 1928. (311,082.)

12,916. "Picture and the like telegraph systems." Telefunken Ges. für Drahtlose Telegraphie. May 21st, 1927. (290,973.)

12,943. "Diaphragms, more particularly for loud-speakers and the like." Siemens & Halske Akt. Ges. May 6th, 1927. (Addition to 287,065.) (289,888.)

13,149. "Electromagnetic controlling apparatus for transmitting movement electrically." G. Brewer (F. Krupp Akt. Ges.). May 4th, 1928. (311,091.)

13,450. "Electric radiators." General Electric Co., Ltd., and L. Gardiner. May 7th, 1928. (311,096.)

14,661. "Electrical filter and the like frequency selective circuits." Marconi's Wireless Telegraph Co., Ltd. July 7th, 1927. (293,446.)

15,134. "Regenerative braking of electric motors." British Thomson-Houston Co., Ltd. May 25th, 1927. (291,057.)

15,832. "Electric heating cushions." J. Bartik and M. Munzer. May 31st, 1927. (291,381.)

18,057. "Electrical condensers of the variable differential type." H. W. Sullivan, Ltd., and W. H. F. Griffiths. June 22nd, 1928. (311,131.)

19,567. "Metal-arc or metal-vapour lamps." H. Stammereich. July 19th, 1927. (294,172.)

20,739. "Liquid film seals for use in gas-cooled dynamo-electric machines." British Thomson-Houston Co., Ltd. July 22nd, 1927. (294,249.)

21,632. "Means for the generation of compressed air for electro-pneumatic devices, in particular clock installations." Junghans Akt. Ges., Geb. December 22nd, 1927. (302,884.)

23,409. "Diaphragms such as are employed in signalling, indicating, and recording apparatus." H. R. G. Moore and T. P. Rigby. August 14th, 1928. (311,154.)

23,630. "Electric cigar lighters." A. Rupps. October 1st, 1927. (298,073.)

28,888. "Electromagnetically-operated vehicle direction indicators." P. Schober and R. Schober (trading as R. Schober). March 26th, 1928. (308,675.)

29,285. "Frame-shorting protective device for generator plants having several bus-bar systems." Siemens-Schuckertwerke Akt. Ges. November 10th, 1927. (300,263.)

31,890. "Railway signalling devices." W. Gabbitass. February 1st, 1928. (Divided application on 310,112.) (310,866.)

32,519. "Shadowless lighting apparatus." Anciens Etablissements Barbier, Benard & Turenne Soc. Anon. February 10th, 1928. (Divided application on 302,105.) (305,646.)

34,783. "Picture and the like telegraph apparatus." Marconi's Wireless Telegraph Co., Ltd. November 25th, 1927. (301,327.)

35,339. "Piezo-electric control of valve oscillation generators." C. Lorenz Akt. Ges. December 2nd, 1927. (301,510.)

35,490. "Vacuum-tube oscillators controlled with piezo-electric resonators." C. Lorenz Akt. Ges. December 2nd, 1927. (301,518.)

38,308. "Circuit arrangements suitable for use in valve transmitters." Telefunken Ges. für Drahtlose Telegraphie. December 29th, 1927. (303,171.)

1929.

7,233. "Magnetostrictive and piezo-electric vibratory systems." G. W. Pierce. January 3rd, 1928. (Divided application on 283,116.) (311,004.)

Trade Mark Applications.

THE following are among the recent applications for British trade marks. Objections against any of the proposed marks may be entered within one month from May 22nd:—

Elephant and Dragon (design only). No. 491,038. Class 1. Accumulator acid. No. 491,039. Class 13. Magneto contact points, &c. No. 491,042. Class 50. Tape impregnated with rubber for insulating purposes.—Elephant Chemical Co., Ltd., 171-173, Neate Street, Camberwell, S.E.5.

Rico (lettering and design). No. 498,132. Class 6. Magnetic separators and parts thereof.—H. G. Richardson, trading as Herbert G. Richardson & Co., Magnet Works, Walsall.

A.C.E.C. (lettering and design). No. 499,662. Class 6. Pumps and electric motors.—Société des Ateliers de Constructions Electrique de Charlerol, Belgium. (British representatives: Feeny & Feeny, 73a, Queen Victoria Street, E.C.4.)

Telelector. No. 501,382. Class 8. Apparatus for use in transmitting sounds and for transmitting and displaying views, scenes, images or messages to a distance by telegraphy or telephony.—Baird Television Development Co., Ltd., 133, Long Acre, W.C.2.

Stella Ray (lettering and design). No. 499,552. Class 13. Lampholders for flood and spot lighting.—Central Electrical Engineers' Accessories Supply, Ltd., 193, Bethnal Green Road, E.2.

Elm. No. 501,223. Class 13. Gas and electric light fittings, reflectors, shades, and parts thereof.—Elm Works, Ltd., Summerstown Road, Tooting, S.W.17.

New Telemetering Equipment.

The General Electric Co. of America announces a rectified-current type of telemeter, which is claimed to be an improved design of remote metering equipment particularly adapted to transmitting voltage and ampere readings of an alternating-current circuit in conjunction with the company's synchronous selector supervisory equipment. This equipment, however, also provides an economical means of telemetering such readings over a pair of telephone wires. When used with the synchronous selector supervisory system, the equipment does not require the installation of extra line wires. One transmitter and one receiver may be connected to any one of a large number of sub-station circuits. The equipment is economical and simple to operate and maintain, since there are no moving parts except the indicating or recording instruments at the dispatcher's station. The synchronous selector system with which this new equipment is designed to operate, provides for the centralised control and indication of various types of switching equipment located at outlying sub-stations. With it, large or small groups of units can be co-ordinated, and thereby the application is broadened to include power systems of all sizes. The new telemetering transmitter consists of the following equipment: a special transformer for each circuit to be indicated; a full-wave rectifier valve; a transformer to supply filament current to the valve; a line-wire compensating resistance, and protective equipment to prevent the possibility of high voltages in the event of the opening of line wires or damage to equipment. The special transformers are of such design that the rectifier will deliver to the receiver approximately 25 milliamperes at full-load current or maximum voltage, as the case may be. The receiving instrument is a standard type direct-current milliammeter adapted to panel mounting. When used in conjunction with a synchronous selector supervisory installation, it can be mounted on the dispatcher's control board.

New Work for Contractors.

Particulars of new works and building schemes for the use of electrical installation contractors in search of work and all interested in the sale of electrical and allied plant and other products.

Publication in this list is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

ALTRINCHAM.—Extension of public offices, Market Street; F. H. Brazier, architect, 7, Market Street.

BARDSLEY (Manchester).—Laboratory, Bardsley Vale Works, for Kerfoot & Co., Ltd.

BLAYDON.—Mining centre; Durham County E.C.

BRIGHTON.—Extensions, borough sanatorium; borough engineer. Hotel, The Dyke; Clayton & Black, architects. Alterations, Old Ship Hotel; R. Bacon & Co., Ltd. Development, London Road estate, Withdean; F. H. Nye. Additions, school for blind boys, Eastern Road; committee of management.

BOURTON-ON-THE-WATER.—Clinic, for Gloucestershire C.C.; R. S. Phillips, county architect, Shire Hall, Gloucester (returnable deposit of £2 2s.).

CARLISLE.—Development of prison site for business premises, for the T.C.; P. Dalton, city surveyor.

CHESTER.—Municipal aerodrome; city engineer. County office extension, Chester Castle; Cheshire county architect.

CHESTERFIELD.—Senior Catholic school; C. A. Edeson, architect, Berryhill Lane, Mansfield.

CRADLEY HEATH.—Works extensions; Ernest Stevens, Ltd.; A. Long, architect, West Bromwich.

CREWE.—School, Newdigate Street, for the borough E.C.; director of education.

DERBY.—Re-erection of Normanton Mills, Charlotte Street, for A. Green, Ltd. (£30,000).

DONCASTER.—School, New Intake, for the borough E.C.; Athron & Dyson, architects, Dolphin Chambers, Market Place. (Returnable deposit of £2 2s.)

DRIGHLINGTON.—Alterations to Council offices; housing scheme (40), Whitehall Road site (deposit £2 2s.); S. H. Senior, surveyor to U.D.C.

DUDLEY.—School, for the borough E.C.; J. Whaley, director of education.

EDINBURGH.—Printing works, for T. & A. Constable, Ltd.; the manager. Additions and alterations to surgical house; medical superintendent, Royal Infirmary. Further works, including dormitories, workshops, &c., at Gogarburn, for District Board of Control (whole scheme £400,000); master of works, Board of Control.

EPSOM.—Extensions, Court House; Surrey C.C.

FIFESHIRE.—Markinch public school, new buildings (electric lighting); G. Sandilands, architect and master of works, Education Offices, Kirkcaldy.

GLASGOW.—Central employment exchange and other Government buildings; H.M. Office of Works.

GRAVESEND.—Machine house and pumping station, Clifton Marine Parade; Imperial Paper Mills, Ltd.

HERNE BAY.—Reconstruction, Tudor Café, Central Promenade; R. Messenger.

HOLMES CHAPEL.—Institution for mental defectives, for the C.C.; clerk, Chester.

HUNWICK.—School enlargement (£8,200); Durham County Education Committee.

KEW.—Building, for the Imperial Bureau of Mycology, for H.M. Office of Works, King Charles Street, S.W. (returnable deposit of £1 1s.).

KIRKCALDY.—Housing scheme (£13,500); District Committee, Fife C.C. Slaughter house, for Corporation (£20,000); burgh surveyor.

LEEK.—School (£10,000), for the Church of England managers; Rev. J. G. Halford, vicar.

LINCOLN.—Extensions, St. Giles' school (300 places), for the City E.C.; R. C. Minton, director of education. Conversion of Nocton Hall into mentally defectives' institution, for the Lincs. Joint Board for the Mentally Defective; clerk.

LONDON (Shoreditch, E.).—School centre, adjoining central school; L.C.C. Education Committee.

(Hendon, N.W.).—Wesleyan church, Watling estate; trustees.

(Beckenham, S.E.).—School (900 places), for the E.C.; J. R. Hambridge, secretary.

(Bermondsey, S.E.).—Conversion of booking hall, South Bermondsey station, to dance hall; F. Gray, 50, Gubyon Avenue, Herne Hill.

LONDON—*continued.*

(Norwood, S.E.).—Estate development, Roxburgh Road and Cheviot Road; W. Wilmot, Ltd.

(Kensington, S.W.).—Tenements, Hesketh Place (£16,526); borough engineer.

(Ealing, W.).—Transformer and garages at Greystoke estate, for Ardsley Estates, Ltd.; T. P. Bennet & Son, 41, Bedford Row, W.C.1, architects. School at Greenford, for E.C. (£30,600); Andersons, Ltd., contractors, Chesterfield.

MANCHESTER.—Pavilion, Queen's Park; A. Fenton. Houses, Lightbowne estate; W. Chappell & Sons, Ltd., Swinton.

MELTON MOWBRAY.—Extensions, War Memorial Hospital (£14,986); Mr. Moore, architect; H. Herbert and Sons, builders, Leicester.

MERIDEN.—Biscuit factory, Castle Bromwich; surveyor to R.D.C.

MORAYSHIRE.—Public hall for Craigellachie; secretary, Hall Committee.

MOSSLEY.—Housing scheme (30), Hollins Farm estate, Micklehurst; G. G. Forster, housing surveyor, Town Hall.

NEWCASTLE-ON-TYNE.—Re-erection of Kirkley Hall, residence of Sir William Noble.

NORTHOLT.—84 houses, Station Approach, Halsbury and Belvue Roads; Estates Improvement Trust, Ltd.; Arohead, Ltd., architects, 20, Copthall Avenue, E.C.

NOTTINGHAM.—Municipal lodging houses; city architect.

PORTSMOUTH.—Church, Battenburg Avenue; Sir W. W. Parker, secretary, Portsmouth Diocesan Extension Committee. Extensions, Town School, Highbury Street; Education Committee. Extensions, mental hospital; city engineer. Showroom, workshop and garages, Grove Road; English Motor Agencies, Ltd. Business premises, London and Oriel Roads, and extensions to warehouse, Buckingham Street; Timothy White, Ltd. Aerodrome, Hilsea; city engineer.

REIGATE.—Public baths, police and fire stations (£28,650), for the T.C.; borough surveyor.

RICHMOND (Surrey).—Station, North Sheen, for the Southern Railway Co.; engineer.

ROCHESTER.—Extensions, St. Bartholomew's Hospital; Read & MacDonald, architects, 2, Bloomsbury Place, Bloomsbury Square, London, W.C.

ROMSEY (Hants.).—Hospital (£13,000), for the Cottage Hospital Committee; Mr. Gutteridge, architect, 9, Portland Street, Southampton.

ROTHERHAM.—Two schools, for the borough E.C.; Vincent Turner, borough engineer (returnable deposit of £2 2s.).

ST. ALBANS.—Central school; Herts. Education Committee.

SALFORD.—Extension of Hope Hospital, Pendleton; clerk to Board of Guardians.

SEVERALLS.—Extensions, mental asylum (£12,500); Essex C.C. and Colchester Corporation.

SHAVINGTON.—Police station; Cheshire Standing Joint Committee.

SHIPLEY.—Erection of works; W. R. Anderton, architect, Midland Chambers.

SOUTHAMPTON.—Business premises, 195-203, Shirley Road, for S. H. Foy & Son (£35,000).

STAFFORD.—Police station, for the T.C.; borough surveyor.

STOURBRIDGE.—Church; Webb & Gray, architects; T. W. Edwards & Sons, builders, Audnam.

STRATFORD-ON-AVON.—Works extensions, Birmingham Road, for N. C. Joseph, Ltd.; W. H. Simster, architect.

SUNDERLAND.—Roman Catholic school, for 350, Corporation Road; Rev. W. T. Harris.

SURREY.—Five police houses, various sites; Surrey county architect.

THIRSK.—Electric wiring and fittings, Congregational Church; Frank Taylor, secretary, 2, Melbourne Place.

WATFORD.—Works, for the Electric Hose and Rubber Co., of Wilmington, Delaware, U.S.A.; F. R. Green, English managing director.

WELWYN GARDEN CITY.—Hospital, Garden City Health Association; secretary.

WIGAN.—School (640 places), for the Blue Coat Church of England school managers.